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MURCHÉ'S DOMESTIC SCIENCE READERS

BOOK IV

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DOMESTIC SCIENCE
READERS

BY

VINCENT T. MURCHÉ

AUTHOR OF 'OBJECT LESSONS IN ELEMENTARY SCIENCE,' 'OBJECT LESSONS FOR INFANTS,' 'SCIENCE READERS'

WITH PREFACE BY

MRS. E. M. BURGWIN

INSTRUCTRESS UNDER THE LONDON SCHOOL BOARD;
MEMBER OF THE N.U.T. EXECUTIVE

BOOK IV

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DOMESTIC SCIENCE READERS

ADAPTED TO MEET THE REQUIREMENTS OF
THE EDUCATION DEPARTMENT

IN THE

CLASS SUBJECT OF DOMESTIC ECONOMY

AS LAID DOWN IN

THE CODE FOR 1896

BOOK I. BOOK II.	STANDARDS I. AND II.—CODE 1896. Thirty object lessons on materials used for food—*e.g.*, Flour, Meat, Vegetables, Tea, Coffee, Milk, Fruits, Salt.
BOOK III.	STANDARD III.—CODE 1896. Chief materials used in clothing and washing—*e.g.*, Silk Linen, Wool, Cotton, Fur, Leather, Washing materials.
BOOK IV.	STANDARD IV.—CODE 1896. Food: its composition. Clothing and Washing. **Note.—The Chemistry of Food should not form part of a scheme for Standard IV.**
BOOK V.	STANDARD V.—CODE 1896. Food and beverages: their properties and nutritive value and functions. The skin and personal cleanliness. *Note.*—The Chemistry of Food is dealt with in this book.
BOOK VI.	STANDARD VI.—CODE 1896. Food: its preparation and culinary treatment generally. The dwelling: Warming, Ventilation, Cleaning.
BOOK VII.	STANDARD VII. Food: simple dishes. Rules for health. Common ailments, and their remedies. Management of a sick-room.

PREFACE

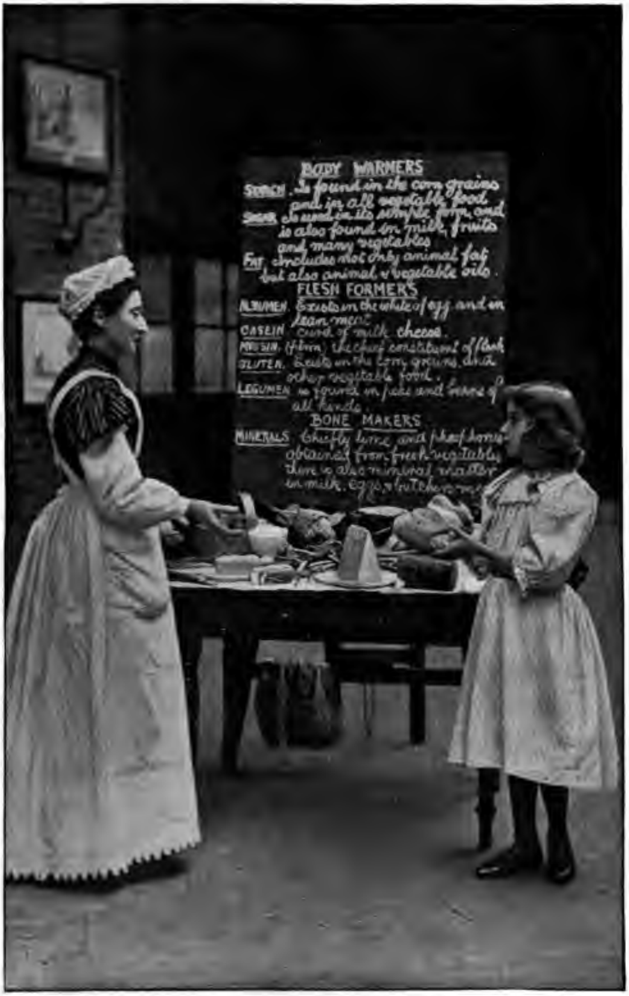
IN this, the Fourth Book, the children really commence the study of the Science of Domestic Economy, to which the earlier volumes have been gradually leading up.

This Book treats of "Food, and its Composition, Clothing and Washing;" and the author, in view of the latest Code requirements, has omitted all mention of the Chemistry of Food, postponing that subject, to be dealt with in the next volume.

The lessons are carefully graduated, and written with a clearness which should make the subject of "Domestic Economy" an attraction to the pupils, for the author has carefully resisted the temptation of enlarging upon matters which at this stage would be beyond their comprehension.

Many dry facts are treated in such a pleasant manner that weariness is avoided, whilst it is not too much to say that if our girls would take to heart the lessons on clothing only, they would benefit both physically and morally.

E. M. BURGWIN.


BODY WARMERS
STARCH. Is found in the corn grains and in all vegetable food.
SUGAR. Is used in its simple form, and is also found in milk, fruits and many vegetables
FAT. Includes not only animal fat but also animal & vegetable oils.
FLESH FORMERS
ALBUMEN. Exists in the white of egg and in lean meat
CASEIN curd of milk cheese.
MYOSIN. (fibrin) the chief constituent of flesh
GLUTEN. Exists in the corn grains and other vegetable food.
LEGUMEN is found in peas and beans of all kinds.
BONE MAKERS
MINERALS Chiefly lime and phosphorus obtained from fresh vegetables there is also mineral matter in milk, eggs, & butchers

See p. 73.

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BOOK IV

PART I—FOOD

LITTLE WOMEN

ONE afternoon Norah and her two cousins, Maggie and Nellie, came running home from school in a high state of excitement.

"Oh, mother," said Norah, as soon as she got into the house, "what do you think? Miss Brown is going to commence a course of training for girls. May I go to the classes? Aunty has promised to let Nellie and Maggie go."

"A course of training, dear," replied her mother. "What do you mean?"

"Oh, it's all to be about household management, mother," said Norah. "Miss Brown called it by a much harder name, but she says that is exactly what it means. The name she gave it was *Domestic Economy.*"

"You are quite right, dear," replied her *mother.* "The word *domestic* refers to the

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house or home. You know we often speak of dear old Ponto, and of Tabby and her kittens as our domestic pets—that is to say our home pets. *Economy* is another name for good management. The two words *domestic economy*, therefore, simply mean *the best way of managing everything in the home.* So all my little girls are anxious to join Miss Brown's class, are they?"

"Oh yes, aunty dear," cried Maggie and Nellie in one breath. "Do, please, let Norah go with us."

"I am very glad, indeed, your mother has promised to let you go," she replied. "Norah shall go too. It is certainly one of the very best things your good teacher can teach you."

Norah clapped her hands with delight. "Oh yes, mother," she cried, "that is just what Miss Brown said. She told us she wanted all her girls to grow up useful little women. Book-learning, she says, is all very well, but she thinks it is better to train girls up in the work which must fall to their lot in the future.

"She led us to think of the time, when we shall be grown-up women; and she told us that the grown-up women we see are very much the same as they were when they were girls.

"That is why she wants to begin early with *our training.* She says that woman's work in *her home is the* highest and noblest work on earth, because of the powerful and lasting influence it has on all about her. For this reason every girl should strive to make herself familiar with all household duties as early as she can.

"Yes, dear, and your teacher is quite right," replied her mother. "The woman who devotes herself to her household duties, and faithfully strives to take a lofty aim in life, not only secures a happy home for herself and those about her, but is really moulding the lives of future generations.

"It is natural for every girl to look forward to the time, when she will be a grown-up woman, and have a home of her own to manage. If her management is good, and wise, and thrifty, she may expect a home such as I have just described. She will be a blessing all round.

"It is generally when the home is badly managed, and there is no comfort in it, that the man is driven out to the ale-house. Depend upon it, more misery, poverty, and crime are brought about by the thriftless, disorderly habits of the woman than some people think."

Just then father came in, and, of course, he had to be told all these new projects. He was delighted with the arrangements, for he had always taken a pride in seeing his own little woman, as he called her, busying herself to help *mother about the* house.

He kissed all three little girls, as they stood round his knee, and then he said, "Do you know, little ones, I came home feeling very tired and weary; but your prattle, and the thought of all you are going to do, has quite cheered me up. It makes me think of the dear old song, and he began to sing—

"*In the cottage there is joy, when there's love at home;*
Hate and envy ne'er annoy, when there's love at home.
Calmly roll the moments by,
Soothing every weary sigh,
Oh! there's One who smiles on high,
When there's love at home.

"But, I say, mother," he added, "this is all very well, but it won't satisfy a hungry stomach, and I see tea is waiting"—and then they all sat down to tea.

Summary.—Domestic economy teaches the art of household management. Woman's work in her home is one of the noblest missions on earth. A good, wise, thrifty housewife is a blessing to all around her.

THE STEAM-ENGINE

Miss Brown had no difficulty in getting together a class of girls, all of them, like Norah and her little cousins, fired with her own zeal and earnestness in the work before them.

When they met on the opening day she said, "Now, girls, the first part of our course is to deal with food; and we shall begin by going across the road to Mr. Marsden's factory. He has promised to show us some of his great engines at work. So come with me."

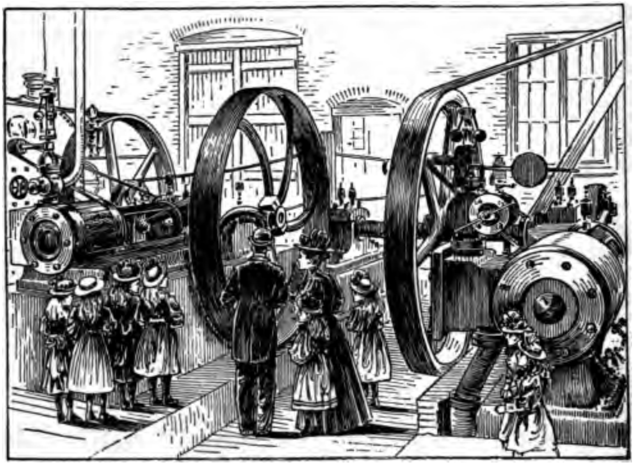
"Whatever can Mr. Marsden's factory have to do with food?" said one girl to another, as they put on their hats. "They don't make food of any sort in the factory."

Norah said nothing just then, for she felt sure Miss Brown had a good reason for taking them to see the engines.

Well, away they went, and in a few minutes the manager was showing them round the great workshops. What a busy hum, and din, and whirl, and rumble, the girls thought it all.

How they admired those great massive engines, and the clever, easy way in which they were doing all sorts of wonderful work.

"This is our new giant, girls," said the manager. "He is just fixed in his place ready for work; and, when he begins, he'll do more than four times as much as these. I shall set him to work to-morrow. And now, he added, "as I have to be busy, you had better look round by yourselves. Miss Brown will see that you don't go too near the machinery, for those great wheels and bands are not very polite, even to ladies," and he went away laughing.



"It was really very kind of the manager to *leave us* here," said Miss Brown. "He knows I vanted to speak to you about his new giant. ook at the great ponderous fellow, with his ods, and wheels, and pistons of polished steel. sn't he a beauty, girls? Wouldn't he look vell under a glass case?"

The girls looked from one to the other, but hey did not know how to answer, for they ould see by her smile of amusement that their eacher was only speaking in fun. At last ne of them ventured to say that engines are ot meant to be put under glass cases. They re meant to work. This one would have to egin work to-morrow, just like the others.

"Can you tell me what the engineer will do, hen he wants to make this great fellow work?" sked Miss Brown. "I will show you."

She pointed out the great boiler, which, she ld them, must be filled with water, and then he showed them the furnace beneath it. This great fellow must be fed with water nd fire, girls," she said, "if they want him to ork; and the moment his fire begins to flag hey must heap on more fuel to keep it going. Ie will not work without his own proper food, nd the more work they want from him, the nore food they must give him.

"If they neglected to feed him, if they hovelled in sand instead of coal, if they *hoked his furnace* with too much, or starved

burned up inside our bodies, very much in the same way as the fuel is burned in the furnace of the steam-engine, and neither the food nor the fuel would burn without air. So then our bodies are like the steam-engine also in this respect.

"Now, one point more, and we have done. The burning of the fuel in the furnace of the engine boils the water in the boiler, and changes it into steam. It is this steam which does all the work. The burning of the food inside our bodies in like manner produces heat; and just as it is heat which keeps the engine at work, so it is heat—the heat of the burning food—which produces the force to make our body work."

Summary.—Our body is a wonderful machine. It is kept going by the food which we eat, just as a steam-engine is kept going by the fuel which burns in its furnace.

THE LIVING ENGINE

"I told you the other day, girls," said Miss Brown, after brushing up their memories with a short chat about the steam-engine, "that our bodies are much more wonderful than the most wonderful steam-engine that was ever made. Let us see whether we can find out why I said this.

"Did you notice the great engine standing useless in one of the corners of the workshop?"

"*Oh yes,*" said Maggie, "and the manager told us that it would never be of any more use. It was worn out, and would be sold for old iron."

"I remember he did say so," replied Miss Brown. "Of course this engine had done a great deal of work in its time, and, like everything else, it had worn away with its work.

"You must not be surprised, when I tell you that these wonderful engines, our bodies, are also wearing out every minute of our lives. Just as those steel rods, and wheels, and pistons of the steam-engine wear away with the work they do, so too do our bodies wear away.

"Every act of our daily life,—the movement even of a finger, the flashing of a single thought through the brain, or the blinking of an eyelid,—destroys some of the substance of the body.

"When we think of this, and then remember how hard people work, day by day, and month by month, it must seem wonderful, that they do not get thinner and thinner every day.

"But we know that people alter very little in appearance, in spite of all their work and wasting away. In fact, if a grown-up man or woman is in good health, the body will vary very little in size and weight for years.

"The wonderful fact is that all over the body there is not only *constant wear and waste*, but also *constant renewal.*

"Bit by bit every part of the body—muscle brain, bone—is not only worn away and destroyed by the work done, but, as it is destroyed, it is renewed or built up again in its original form.

"Another very wonderful fact follows from this. I have been Miss Brown to class after class of girls like you for several years. I am the same to them as ever I was; they do not see any difference. Yet the actual flesh and bone, that make up my body now, are not the same flesh and bone, of which my body was made years ago. That is all gone, and new flesh and bone has been built up in its place.

"All this building-up work is done by the blood. If I prick myself in any part of my body, blood will flow. There is blood flowing through all parts of the body, and it is this blood, which builds up what has been worn out.

"It carries all the materials for building. To the muscles it gives certain materials for making muscle; to the bones it gives up others for making bone; in the brain it leaves others again for making nerve matter, and so on.

'But it never leaves bone-making materials for building up muscle, or brain; nor does it take to the ear what is wanted for the eye. It never makes mistakes.

"Now, I think, you will begin to see that this body of ours is, as I said, a very wonderful engine indeed; for it actually repairs itself, fast as it wears away. But I am sure you a still in the dark on one point. You want know how the blood gets all its building a repairing materials."

She looked at the girls, as she said this, a their faces told her she had guessed right.

"Oh yes," said Norah. "That's the ve thing that has been puzzling us."

"Then you shall not be puzzled any longe said Miss Brown. "The blood gets all materials from the food which we eat.

"All the materials whether for making bo brain, or muscle, or any part of the substance the body, are brought by the blood to the s where they are wanted; and *the blood gets th all from the food* which we have eaten.

"Now, I think," she said in conclusion, "y will clearly understand that our food has to two things. It must provide a sort of fuel, whi will burn and produce *heat*, and *force* to ma the body work; and it must also provi materials for building up all those parts, whi are worn away with the work they have do Isn't our body a wonderful machine, girls?"

Summary.—The body wears away with its work; but as it wear is renewed or built up again in its original form. The blood brings materials for building; it gets them from the food. The food supplies fuel, which burns and produces heat and force.

The Living Machine grows

"We are going to learn something more about these wonderful bodies of ours to-day," said Miss Brown. "I think I shall be able to show you that they are even more wonderful than you have yet imagined. Last time we compared the body of a grown-up man or woman with the steam-engine. I want to talk about your own bodies to-day, which, of course, are not grown-up.

"You saw the great steam-engine, which the manager of the factory called his new giant. It was, as he said, only just set up, ready for work. It was, in fact, newly made. Now how big will it be, if we go to see it after three or four years?"

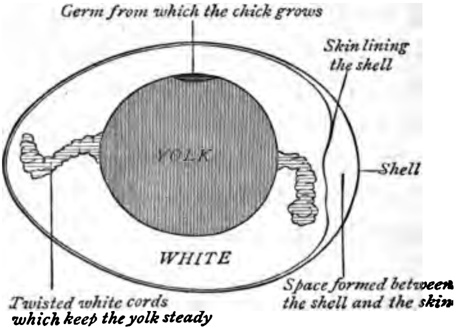
Of course, all the girls were ready to tell that the engine would be just the same size then, as it was when they first saw it.

"Now I want you to think of your own bodies," said Miss Brown. "You know (although you cannot remember the time) that you were once tiny little babies. Some of you are, no doubt, useful little mothers at home now to other tiny baby brothers or sisters, so small that you can easily nurse them and carry them about.

"Remember that each of them is a complete machine, although it is so very tiny. It will grow and grow from day to day, till it is as big as you yourselves. You will grow in the san way, till you become grown-up women.

"What a wonderful machine our body girls! There is nothing so wonderful as this those great powerful steam-engines.

"I have here a hen's egg. I will break it this cup, as your mother does when she is goii


Germ from which the chick grows
Skin lining the shell
YOLK
Shell
WHITE
Twisted white cords which keep the yolk steady
Space formed between the shell and the skin

to make a pudding or a custard. Look at t egg in the cup. There is a clear, sticky liqui in the midst of which floats a round yellow bal

"I have no doubt you have already been to that we call this clear liquid the *white of egg*, a perhaps you may have heard its other nan *albumen*. The yellow ball is called the *yolk*.

"Notice the little round spot in the yolk. this egg had been hatched, by keeping it war for about three weeks, that little round sp *would* have become an actual chicken; it woul have had strength enough to break the shell and set itself free, and would then have been able to run about and seek its own living.

"Now how does it happen that a little speck like this can grow into a chicken? Let us see.

"The whole of the egg, except the little speck itself, is simply a store of food, laid up within the shell, for the tiny thing to feed upon.

"Day by day, it absorbs more and more of this food store, and with it builds up its own body. Day by day, the little body is growing bigger and bigger, and the store of food is getting smaller and smaller, till it is all gone.

"Then it pecks with its beak on the inside of the shell until it breaks, and out it comes— living chick.

"If we were to take it up in our hands an examine it, we should find the little body to con sist of flesh and bones, with tiny feathers alread growing on the skin—eyes, bill, feet, everythin perfectly formed. Its body, too, would fee warm, and it would show, by its struggles to ge free, that it had a certain amount of strength.

"Now, all these things—the flesh, bones, an blood of its body, with the clothing of feathers as well as the warmth which you felt, and th strength which it shows—all come from the foo which it has taken while in the egg-shell.

"The little chick, moreover, has to grow int a large fowl. How is this brought about? Th food which it eats, after it is able to run abou and seek its own living, does it all.

"Mother feeds baby with milk, and all of yo know how he grows day by day, till he is firs able to stand alone, then to toddle about, and las of all to run. The food does it all; and you food, too, it is that makes you grow from day t day, and from year to year.

"But you must remember that, even while yo are growing, some parts of your body are bein used up with the work which you do. Pictur yourselves working with your brains at you *lessons in school;* skipping, romping, laughing talking, singing at your play; or helping mother in little odd things at home; and you will see what a great amount of waste there must be.

"So, then, food warms our bodies, and gives us power to work, and play, and run about; it builds up our bodies, while we are young and small, so that they grow big; and all our lives it repairs the waste caused by the work we do. What wonderful machines our bodies are, girls!"

Summary.—The body of an infant is a complete machine; but it grows till it reaches maturity. It is the food which makes the body grow from day to day.

ABOUT OURSELVES

"In speaking about this wonderful machine, our body," said Miss Brown, "I have several times mentioned muscle, bone, nerves, and blood. I want you next to get a clear understanding about each of these. So we will have a chat to-day about ourselves, girls.

"Let us commence with the bones. We can feel, in every part of our body, the hard, solid framework on which the body is built. This strong framework is called the *skeleton*. It consists of more than two hundred separate bones, of various shapes and sizes, intended to support the softer fleshy parts of the body.

"If you call to mind the various animals you have seen, you will find that, in every one of them, it is the skeleton which determines the shape of the body.

"Some of the bones of the skeleton, such for instance as the bones of the skull, are fixed and immovable; but most of the bones are jointed together in such a way, that they can move one upon the other. The bones of the limbs, for example, provide for every variety of movement.

HUMAN SKELETON.

"Think how easily you can open and shut your hand, bend and straighten your arm or leg, and throw your arms round and round. Think how arms and legs both go to work in skipping.

"Let us look next at the force, which puts all this machinery in motion.

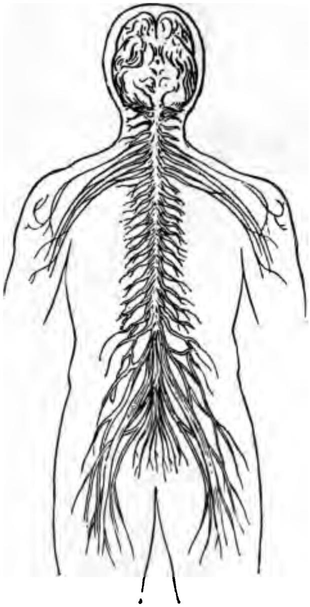
"If the white skin all over the body were stripped off, the red flesh would be seen beneath. *This red flesh is muscle.* The muscles are the *agents, by which* all the movements of the body are carried out, for every bone is moved by some muscle.

"Hence, where the greatest power of movement is required, there we find the largest and strongest muscles. Think of the work, which the legs and arms have to do, and you will see at once the reason, why their muscles are placed in solid-looking masses round the bones.

THE MUSCLES.

"But the muscles could not move of themselves. When we wish to lift our hand, or turn our head, it is the *nerves* that make the muscles do our bidding. If the nerves were destroyed or injured (as they sometimes are by paralysis), we should find ourselves quite unable to lift the limb, however much we might wish to do it. And now I suppose you would like to know something about these nerves.

We must begin with the *brain*, for that the great centre, from which all the nerv spring.



BRAIN, SPINAL CORD, AND NERVES.

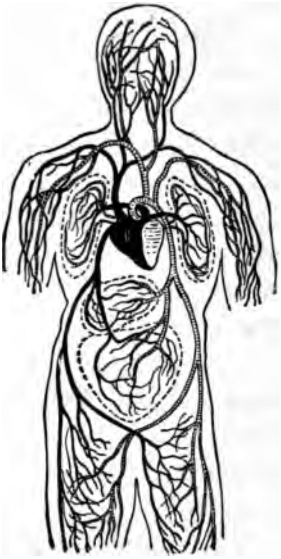
“The brain, you know, is lodged in the skul which is simply a hollo bony box, made spec ally to hold it. It fil the entire cavity of th skull, and a portion of i like a thick white cor passes out of a hole i the bottom of the bo and stretches downwar through the middle the long string of bone which form the spine back-bone. This lon white cord, then, is reall part of the brain. It called the *spinal cord.*

“From the brain an spinal cord, long silver white threads stretch in every direction. Thes are the *nerves.* Some of them go to the ear, som to the eye, some to the nose, some to the tongu and some to the skin. It is by means of the that we are able to hear, see, smell, taste, an feel things around us. We call these powers th *five senses.*

"Other nerves spread themselves among the muscles of the body. They are the foremen or overseers which set the muscles to work.

"We have just one other thing to consider now, and that is the blood. You know it is the blood that carries the material for building up and repairing the machinery, as well as the fuel for producing the force which sets the machinery going.

"This blood is carried all through the body in pipes, which we call *blood-vessels.* It is pumped along these pipes by a pump of its own, which never leaves off pumping from the first dawn of life till death comes. This pump is the *heart.* You can feel your own heart at its pumping work now, if you place your hand on your chest. It is the heart that pumps this blood, laden with materials from the food, into the very parts of the body, where they are wanted.



HEART AND BLOOD-VESSELS.

"Isn't our body really a very, very wonderful machine, girls?"

Summary.—The skeleton is made up of more than 200 separate bones. They form a strong frame-work for the body. The muscles move the bones. The nerves make the muscles work. The brain is the centre of the nerves. The blood is pumped, by the heart, through the blood-vessels, into all parts of the body.

FOOD

When the girls next met, Miss Brown, as usual, before commencing the new lesson, seated herself in the midst of them, for a little quiet chat about what they had already learned.

These short chats were very pleasant all round, and it was astonishing to see how readily one girl always came to the help of another, whose memory failed, till at last the whole story was told, and by themselves.

"I think we may now go a step or two further," said Miss Brown. "We know a little about our body, and we also know the object of taking food. It is time we began to learn something about the food itself.

"Eating and drinking is such a pleasant occupation, when we are in good health, that some people might imagine that we eat merely for the pleasure it gives us. You already know better than that however.

"When we have not taken food for some time, we begin to feel a peculiar emptiness inside; we become faint and weary, and unfit for either work or play; we feel a great desire to eat—

we are hungry. We go to our meal, and come away from it with renewed vigour, ready to resume our ordinary tasks.

"If we are in a healthy condition, this desire for food returns several times a day. We are said to have *a good appetite*. Indeed, if our appetite falls off, we know that something is wrong; we have to see the doctor.

"If we were kept without food, our body would shrink and lose weight, and we should gradually become unable to do any work with either body or mind.

"I think you fully understand that it is the blood, which carries the materials all over the body, to the very spots where they are wanted?"

"Oh yes, teacher," replied Nellie; "but you told us that the blood gets all these materials from the food."

"That's quite right, Nellie," said Miss Brown. "*The body feeds on the blood*, and *the blood itself feeds on the food* which we eat. But I am going further than that now. I want you to remember that the food has actually to be changed into blood.

"Yes," she repeated, seeing the look of astonishment on the faces of the girls, "the food which we eat must be made into real blood, if it is to do us any good. The bread and butter, meat, pudding, potatoes are quite useless as they are. They must be *digested* in the stomach. The whole work of digestion is to change the food into blood fit to feed the body. Some day you shall learn how this is brought about.

"Now, it is clear that a tailor must have cloth to mend a cloth coat; a shoemaker must have leather to mend a pair of boots; and a blacksmith must have iron to mend an article made of iron; and it is just so with the body. The body itself can be mended only with the proper materials.

"I want you to be clear upon this point, because it does not follow that everything is food, merely because we eat or drink it. If we take things, which cannot be digested and made into blood, they will not feed or nourish the body, and *such things are not food.*

"This will give you the whole reason for our course of lessons on food. You will all some day have to choose and prepare food for yourselves and others. It is most important that you should know what kind of things to choose.

"In some homes, either through ignorance or carelessness, this important matter is neglected in providing the daily meals; and the children, in consequence, are weak, unhealthy, and puny in appearance. No trouble is taken to find out *the most suitable* articles for food, and the meals simply load the stomach with things which can never be made into blood, and therefore cannot nourish or feed the body. Those things are not food.

"People in this unhappy state eat; *but they do not feed*, because a large part of what they eat is not actual food. Such things do them harm rather than good, because they overload the stomach with that which it cannot digest, while the body itself does not get its proper nourishment."

Summary.—The food we eat must be digested before it can do us any good. Whatever is undigested cannot feed the body: it is not food. Digestion changes the food into blood; the blood feeds the body.

MATERIALS FOR THE BODY

"We arrived at the conclusion the other day, girls," said Miss Brown, "that everything we eat is not of necessity food, merely because we eat it. There may be a very great difference between *eating* and *feeding*. That which we eat is only food, when it can feed or nourish the body —in other words, when it can repair the parts that have been worn out."

"You at the same time reminded us," said Norah, "that we always mend things with the materials of which they are made. I know this is right with most things, and I have thought a great deal about it since our lesson. But I am puzzled, when I begin to think of mending my body with the kind of food which I eat."

The girls all looked up eagerly while Norah was speaking, for this was the very thing which had been puzzling every one of them. Their food and the flesh of their own bodies did not seem to be the same kind of stuff at all.

Miss Brown smiled, and said, "I am quite prepared, girls, to find you puzzled at this. I will try and make it all clear to you. But I must again repeat, that the substance of the body can be built up, or repaired, only with the same kind of material as that of which it is made.

"Before we can say whether any one thing is fit for food, we must learn something of the materials which make up the body itself.

"Let us begin with the flesh. Think of a piece of lean flesh — a joint of beef in the butcher's shop. It looks very solid as it hangs there, but if we were to place it over a fire, we should see it begin to give off vapour; and it would continue to do so, until it had lost the greater part of its weight.

"In fact, if the piece of beef weighed 100 pounds at first, it would weigh only 23 pounds when it had been perfectly dried.

"We know that the vapour, which it gives off, takes nothing with it. Everything but the water is left behind. So then our solid lump of beef, weighing 100 pounds, contained no less than 77 pounds of water.

"The 23 pounds of solid matter left behind is a substance composed mainly of the very same thing, which we found in the hen's egg, and which you first called *white of egg*, but have since learned to call *albumen.*

"It is the most important solid material of all flesh. It forms the *muscular part,* that is the flesh in our own bodies, as well as in the bodies of all animals.

"Suppose we pass on to consider bone next. I have here a bone that has been lying, for the last day or two, in this dish, covered with something that looks like water. It is not really water; there is some strong acid, called *spirits of salt,* mixed with the water.

"If I remove the bone from the acid, and dry it, I think it will teach us something.

"You shall come and take it in your hand, Maggie, and see what you can find out about it."

After handling it for a minute or so, Maggie said, "Bone is always hard; this is not hard, for I can press my finger-nail into it."

While she was saying this she pressed rather harder than before, and, to her surprise, it bent with the pressure. She then began to bend, pull, and twist it about, for it was no longer firm and rigid like bone, but very flexible.

"That is exactly what I wanted you to see," said Miss Brown. "Now look again, and notice how easily I can cut it with this knife. I could not cut bone, could I?

"The acid has dissolved out of the bone all the material, that made it hard and rigid. That which remains is a gristly kind of substance. If we boiled it in water, it would yield a sort of glue, which we call *gelatine.*

"It is important to remember, however, that this material for making bone substance will not make muscle or flesh; nor will that which is meant for flesh also make bone.

"Now let us look at bone from another standpoint. Here is a bone, similar to the one I took out of the acid,—or rather, all that is left of the bone. It has been burnt in the fire.

"Take it in your hand, Maggie, and examine it as you did the other.

"The first thing you notice is that although like the other, it keeps its shape, it is very much lighter than you expected it to be. Now bend it, as you did the other. You see it snaps, and breaks up in your fingers, for it is very brittle.

"The fact is, all the glue-like substance has been burned out of this bone, and that which remains is earthy, mineral matter. Baby's bones *are made almost* entirely of that gristly substance first; they become changed into actual, hard, gid bone by this earthy or mineral matter.

"Let us lastly turn to the blood. If we ied some blood over the fire in the way I have scribed, we should find that 76 parts out of ery 100 would pass away in vapour, and 24 rts of solid matter would be left behind.

"This solid matter consists chiefly of the two bstances, of which the flesh and bones are rmed. You must remember that the blood s to feed the bony parts, as well as the fleshy ructures of the body. This explains why we d in the blood all the materials for the work. ut whence does the blood get its materials, rls?"

Summary.—The substance of the body can only be built up and paired by materials exactly the same as those of which it is made. e blood contains those materials: it gets them all from the food.

Where Food comes from

As the girls took their places, one by one, at e next meeting of the class, they could not elp wondering what was going to happen. here stood Miss Brown behind a great table, iled up with articles of food of all sorts.

It almost looked as if she was about to open shop, only they had never seen a shop, with e articles all heaped together in such confusion.

In the middle of the table was a large c
bage, and next to that was a herring. Then ca
a loaf, some sugar in a basin, and a piece
beaf-steak. But there,—I could never tell y
how the things were mixed up on that table.

Cheese, potatoes, bacon, eggs, salt, app
and other sorts of fruit, suet, raisins, pepp

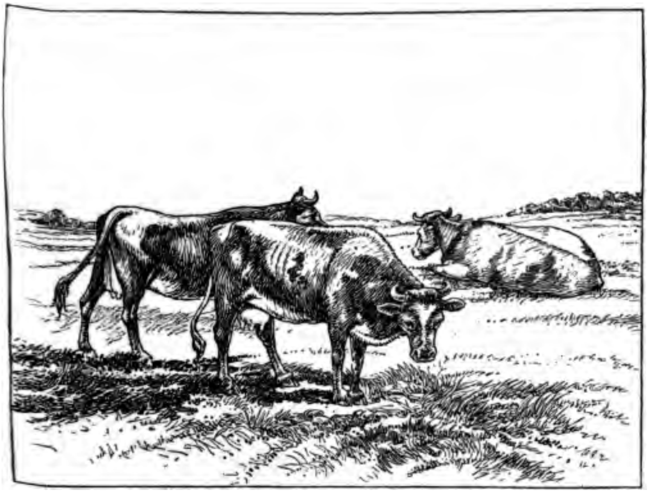
milk, sago, fish, oatmeal for making gruel, carr
and turnips, mustard, arrowroot, tea, a gl
of water, currants, a mutton chop, cocoa, la
peas and beans, coffee, rice, candied-peel, dr
ping;—these will give you some idea of
kind of things that were spread all over
table.

"Now, girls," began Miss Brown, when
length they got over their surprise, "we
[illegible]*g to talk* to-day about the sources, fr

which we get the various articles of food, that we see on the table at meal-time.

"But before we do that, I want you to think about some of the animals you have seen, and the food they eat.

"If you go into the country, you see the sheep, cows, and horses feeding on the grass in the meadows. They are quite content with that food, day after day, and do not wish for anything else. In the winter, when they cannot get fresh grass, the farmer feeds them with hay, corn, and turnips.



"You may perhaps have seen the little wild rabbits running about in the evening. They come out of their holes then to feed upon th crops that are growing in the fields."

"But all animals are not satisfied with suc food as this," said Norah. "I know how carefu uncle is to see that his ducks, and geese, an fowls are shut up at night, for fear Mr. Fo should carry one of them off."

"Quite right, Norah," said Miss Brown "The fox would not touch the food which cow sheep, and rabbits eat. He would starve in field, where there was nothing but grass. H prefers the flesh of some animal. The cat, to in like manner, would rather have a mouse f dinner than anything you could give her.

"In some lands there are fierce flesh-eatin animals, strong enough to carry off, and devo a horse, as easily as a cat could a rat.

"What I want you to notice is that each these animals lives on one particular kind food; and this is not merely because they li it better than other things, but because they a meant to feed in this way.

"We, as you know, eat, not one kind, b many different kinds of food. We are like t fox and the cat, in one sense, for we eat fles but we are also like the other animals, becau we eat vegetable food.

"We will now place another table on ea *side of* the big one, and I shall want you to he me arrange all these articles in their proper places. Let us begin with the one on the right. Your work will be to place on it all the *animal food.* We will then deal with the other, which is to hold all the *vegetable food.*"

With these instructions the girls set to work, starting with the articles for the first table. Of course the beef-steak, mutton-chop, bacon, eggs, and milk were soon selected; and there was not much difficulty, either, with the fish, cheese, and butter. But somehow the suet, lard, and dripping seemed for a time to puzzle them. However they got over that difficulty at last, and their table was set out, with all the articles of animal food. The other table then followed, and this seemed quite easy in comparison, for in a little while they had cleared the big table of everything, but the salt and water. Then came another puzzle. Seeing that they were in a difficulty, Miss Brown at last came to their help.

"So the salt puzzles you, does it? Where does it come from, girls?" she asked, and of course this was quite enough.

"It is got out of the earth," replied Norah. "It is neither an *animal* nor a *vegetable* substance. It is *a mineral.* I had forgotten that."

"Quite right," said Miss Brown. "*Salt is a mineral food.* Water, too, comes out of the earth. You know it is sometimes pumped up, and sometimes drawn up in buckets out of the well. Therefore, as water is neither an animal nor a vegetable substance, it must be set, side by side, with the salt, as a mineral. And now we have all these articles of food arranged in three classes—*animal*, *vegetable*, and *mineral*."

Summary.—Our food consists of animal, vegetable, and mineral substances. Mineral matter is required for building up the bones, which at first are only like gristle. The mineral matter hardens them.

BODY-WARMERS

"We are going to talk about our internal fires to-day, girls," said Miss Brown, "and find out how it is that they are kept burning, night and day, all through our lives. You know we warm our rooms with fires made of coal and wood, and those fires will give out heat, only so long as we keep them fed with fuel. If we do not add fresh fuel from time to time, or if we throw on stuff that will not burn, the fires will die out.

"I shall try and show you that it is exactly the same with these fires inside our own body. They too must be fed with fresh fuel from time to time, or they would go out, and we should die.

"But before we begin to speak about our internal fires, I want you to dismiss from your minds all thought of fire, with flame and smoke, such as you are accustomed to see. You must not imagine that your inside is a blazing furnace. It is quite a simple matter to produce great heat without either smoke or flame.

"See, I have in this saucer a little syrup, made by mixing some powdered sugar in water. Hold the saucer, Norah, while I pour a few drops of this liquid (*sulphuric acid*) on it."

Norah did so, and the rest of the girls looked on. Presently they saw some wonderful change taking place in the syrup. But I don't know which astonished them most—the black mass, that they saw swelling up from the syrup, or the half-frightened way in which Norah almost threw the saucer on the table.

"Ah," said Miss Brown, "that is the very thing I wanted you to learn. I did not light any fire in the saucer; there was neither blaze nor smoke. But it soon became so hot from the heat which came from the syrup, that you were glad to put it down. So now you see it is quite possible to have heat without either blaze or smoke; and remember, this is the kind of heat which warms our bodies.

"Just as we give one general name—*fuel*—to all substances which burn in our fire-grates, so also we give one general name—*fuel-food*—to all foods which burn in our bodies and produce heat there. We might also call them *body-warmers, or heat-givers.*

"But these fuel-foods produce something else besides heat, I think," she added.

"Oh yes, teacher," cried several of the girls. "They produce the *force*, or *power*, which makes the body work, just as the fuel produces the steam, which makes the engine work."

"Quite right, girls," replied Miss Brown "and this is the reason for their other name—*force-making foods.* Now remember that *fuel foods*, *body-warmers*, *heat-givers*, and *force makers*, all mean the self-same foods.

"Such foods are altogether different from those, which supply materials for building up and repairing the body itself. You will under stand how important they are, when I tell yo that we require more than four times as muc fuel-food as building-food.

"A man doing ordinary work requires abou 21 ounces of solid food daily. That is to sa if his day's food were dried, there should be 2 ounces of solid matter left. Of this 21 ounce rather more than 16 must be fuel-food.

"That quantity would be just sufficient t produce the necessary heat, and to provide th working force which he requires. And now, think, I have said enough to prove to you th importance of these *fuel-foods*, or *body-warmers.*

Summary.—*Some of our food is for the express purpose of warmin our bodies. It is burned up, and in burning produces heat. Thi* called *fuel-food.* We might call it *body-warming,* or *heat-giving food.* It also produces force to make the body work. Hence it might be alled *force-making food.*

Body-Warmers—Fats and Oils

When the class next met the girls saw the wo words—*Body-Warmers*—written on the black-board. This was sufficient to lead their houghts back to the last lesson, and they were prepared for the little rapid brushing up, which Miss Brown always gave as a commencement.

"You know, girls," she said, when that was over, "some kinds of fuel burn better in our grates, and give out more heat than others. We are now going to see that it is just so with the fuel-foods, that burn in our bodies. They all burn, but some of them burn much better, and give out much greater heat than others.

"I want you to come to the front to assist me, Norah. We will try and amuse the girls by showing them how some things burn.

"Take, to begin with, these dry crusts of bread, and put them on the red-hot part of the fire. You see they burn, and in time would burn away altogether. Still they burn very slowly.

"Now throw a handful of those corn-grains on the fire. These, you see, crackle away and burn too. Indeed they burn much more *briskly than the* dry crusts of bread.

“Now, notice what happens when I th this piece of fat on the fire. In an instant blazes up, and burns fiercely till it is all c sumed. So, too, would these pieces of lard, butt dripping, and suet. They are all fat.

“Watch now while I pour some of this oil the fire. It instantly bursts into a flame, a burns even more fiercely than the solid The blaze darts up the chimney in a moment.

“This shows you that fats and oils all b very fiercely ; now we will go a step further.”

The girls looked on, while she raked a red-hot cinders out of the fire into the fire-sho She placed this on two bricks in the middle the table, and then stood a small kettle over i

“I have put some water in the kettle, gir she said. “We are now going to boil it, and make our fire burn better, Norah shall thro handful of this chicken's mixture on it. mixture, you see, consists of wheat, maize, r barley, oats, peas and beans. Now let us wa our kettle boil.”

They watched, and saw that the corn-gra did make the fire burn more brightly, but th had to wait some time before they could t by the steam coming out of the spout, that water was boiling. Still it did boil, and M Brown explained that it was the heat from *burning* grains that had made it boil.

"Now, we will empty our kettle," she said, ll it again with cold water, and boil it as we l the other."

She raked out some fresh cinders into the ovel, and stood the kettle on the trivet over as before. This time, however, she dropped piece of tallow-candle on the red-hot cinders.

In a moment the fire blazed up fiercely all und the little kettle, and the girls were tonished to find how quickly the steam began to puff out, showing that the water w boiling.

"I think you will now understand clearly she said, "not only that fats burn fiercely, b that in burning they give out very great hea It is because of this that fatty matters of a kinds are such important articles of food. Th burn fiercely in our bodies, and in burning gi out more heat than any other kinds of foo *They are the best of all the body-warmers.*

"Of course you have all heard of the po Esquimaux, who live in the cold frozen North

"Oh yes, teacher," said Norah. "They k the animals that live there, and clothe themselv in their thick fur coats to keep themselves warm

"Quite right, Norah," said Miss Brown; "b remember, those thick fur coats do not *ma* them warm; they only *keep* them warm, becau they prevent the bodily heat from escaping.

"Look at this funny picture. Here y see an Esquimaux father seated on a block ice, spear in hand, watching at the big hole whi he has cut in the ice. His two children are seat on the ice by his side watching intently too; b although it is piercingly cold they seem comfo able enough. Their inside fires are burning we and those thick furs they wear will not all the heat to escape from their bodies. They a waiting for a seal to come up and breathe.

"Here is another picture for you. They have got their seal now, and father, you see, is busily engaged cutting it up for dinner. He cuts off lump after lump of the raw seal-fat or blubber, and hands it to the children, who eat *it and relish it* just as it is. They want

it for their internal fires; it is a splendid *bc warmer.*

"And what do you think is the favou drink of these people? I will tell you. T boil down the fat and make oil, and this t drink just as we drink tea, coffee, and cocoa.

"I might also tell you that they burn thiѕ in lamps to warm their snow-houses, just as burn coal in our fire-grates to warm our hou It is their *fuel*, as well as their *fuel-food.*"

Summary.—Fats and oils of all kinds are the best body-war They burn fiercely and give out great heat. Grains of corn also *and give out* heat, but not so much as fat or oil. They contain *giving food.*

BODY-WARMERS—SOURCES OF FAT AND OIL

"I hope you have been thinking over our last lesson about the fats and oils, and their uses as *body-warmers*," said Miss Brown.

"I think, from what we have already learned, you will clearly understand that the solid fat of all sorts of meat, as well as the dripping which the cook collects, while she prepares them, must be classed among these fuel-foods.

"Suet, you know, is simply the solid fat, just as it is taken from the sheep and the ox. Lard is pig's fat boiled, or tried down, as we say.

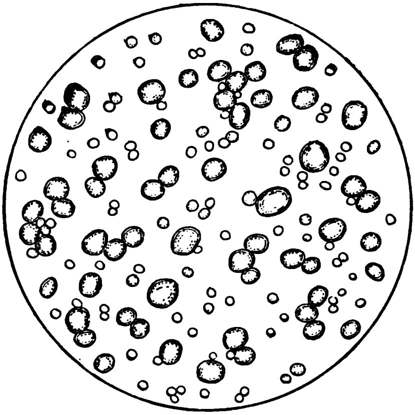
"But fat is obtained from many other things, besides the carcases of animals. Let us see.

"Milk, you know, is a very important article of food, not only in itself, but because from it we obtain butter and cheese.

"We often speak of milk as one of Nature's foods, and by that we mean to say that it is a perfect food—it contains everything that is required to support life.

"You will easily understand this, if you think of the little calf during its early life. It lives entirely on the milk which the mother cow supplies, and in this milk the little thing finds all that it needs. Then, again, think of baby during the first year of its life. All that time *milk, as you know*, is its only food; and yet, if it is strong and healthy, it grows and thrive more then than at any other time.

"If milk is a perfect food it must contain body-warming matter, as well as material for building. I will show you that it does, for we are going to examine a drop of milk now with the help of this microscope.



A DROP OF MILK MAGNIFIED.

"This powerful magnifying glass," she continued, when the girls had one by one looked through the lens, "shows you an immense number of little rounded balls floating about in the milk.

"These balls are tiny globules of fat. They form the *fuel-food of the milk.*"

"*Oh yes,* I remember," said Norah. "These *little balls* of fat rise to the surface and form ream, when the milk is allowed to stand; and he cream is skimmed off to make butter."

"Quite right, Norah," said Miss Brown; "and ow let us think of cheese, the other product of nilk. Cheese is made from the curd of the milk, ut in most kinds of cheese there is more or less ream mixed with the curd. Only those made rom skimmed milk are entirely without cream. So then we must reckon milk, butter, and cheese s supplying us with fuel-food.

"We have already seen that the egg, another f Nature's foods, must be a perfect food, for we know that it contains everything that is needed for the support of the tiny chick, till it is able to break its shell, and come out to seek its own living.

"Its bodily warmth and energy are derived from a store of oily, fatty matter laid up in the yolk. The yolk of egg, therefore, as well as the cream of milk, is one of Nature's fuel-foods.

"Certain kinds of fish, too, such as herrings, sprats, mackerel, and salmon, are of an oily nature. Their oily flesh is another source of fuel-food. We usually call them fat fish, to distinguish them from the sole, whiting, plaice, turbot, and others, whose flesh is white, and contains no oily fat.

"Then, too, in addition to all these, which re *animal fats*, there are vegetable oils. In some countries, for instance, the people use oil, just as we use butter. It becomes tc an important fuel-food.

"But you will no doubt be surprised t that there is a small quantity of fat or most vegetable food. Even the corn-gr wheat, oats, maize—contain a little fat."

Summary.—The cream of milk is one of nature's fuel-f consists of tiny balls of fat. It is churned into butter. T egg is another of nature's fuel-foods; it supplies warmth and the growing chick.

Body-Warmers—Starch and Suga

"We are now going to think for a few m about our little experiment of boiling the in the kettle," said Miss Brown.

"You remember we boiled it with the which came from a piece of burning fat saw that the fat burned fiercely, and ga so much heat that the water very quickl to the boil; and this led us to the consid of fat as a *fuel-food* or *body-warmer.* else did I use to boil the kettle?"

"You made it boil by burning some ch mixture, which you told me to throw fire," said Norah.

"Did the water boil as quickly as it di the burning fat?"

"No, teacher," replied Norah again; "it took a longer time to boil."

"What did you learn by that?" asked Miss Brown.

"We learned that, although the chicken's mixture burns, it does not give out so much heat as the burning fat," replied Norah.

"Quite right, Norah," said Miss Brown. "Now what did the chicken's mixture contain?"

"It contained grains of corn—wheat, maize, oats, barley, and rice—and a few peas and beans," said Norah.

"Now, think for a moment about those corn-grains. There is one sort of material in all of them; it is the chief material of which they are all made. Can you tell me what it is?"

"Oh yes," said Norah eagerly. "They all contain starch. Our old lessons taught us that. *I remember how* we used to separate the starch from flour, by washing and kneading a pie dough in a muslin bag under water."

"Quite right," said Miss Brown. "Star the material I had in my mind; because, those grains of corn were burning on the fi was the starch in them that gave out the which boiled the water.

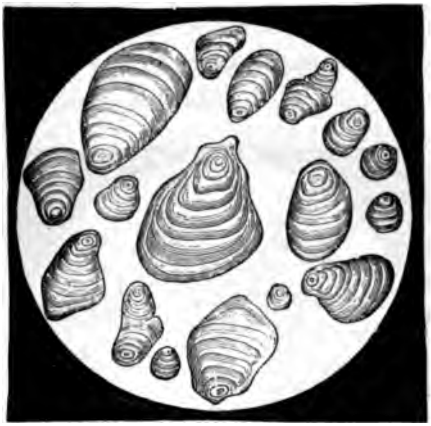
"I may as well tell you that starch is fo more or less, in all vegetable food. It for most important part of the substance of al corn grains. Sago, arrowroot, and tapioca nearly pure starch, and so is a boiled, n potato. Peas and beans, too, contain a cons able amount of this material.

"It is important to remember that, in w ever part of the plant the starch is found, always met with in the form of tiny grains small to be seen with the naked eye.

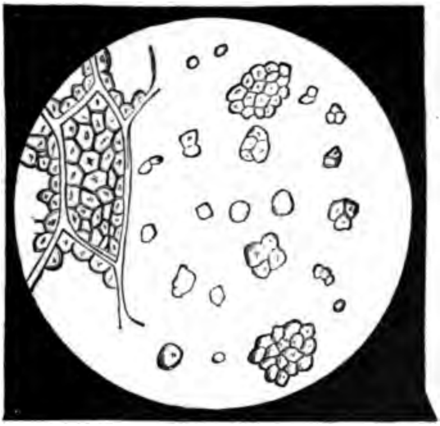
"I have some drawings here which show the starch grains would look like, if they wer amined under a microscope." When they ha amined these drawings she added, "Here is arrowroot, which I will mix up into a thin with water. I want some of you to take a of it on your tongue, and hold it there for minutes. You shall then tell me what you no

The girls did so, and in a very short *found that the* arrowroot began to taste swe

"*You are* quite right, girls," said Miss B when they told her, "it is becoming sweet. Let us see what it means."



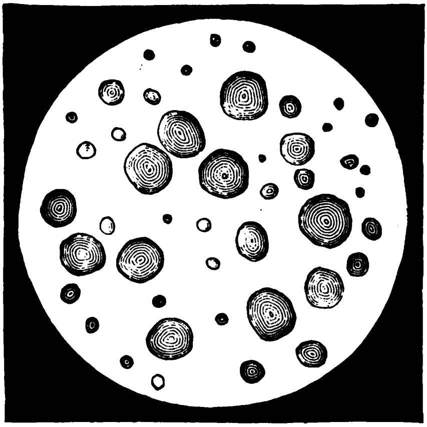
STARCH GRANULES FROM THE POTATO. (Multiplied 300 diameters.)



STARCH GRANULES FROM RICE. (Multiplied 300 diameters.)

She mixed some starch in water, and to it a little sulphuric acid. Then she pour mixture into a shallow tin dish, and bo over the spirit-lamp.

"Now," she said, "I am going to give surprise. When this mixture cools you



STARCH GRANULES FROM WHEAT. (Multiplied 300 diame

taste it, and you will find it quite sweet. *acid has changed the starch into sugar.*

"Now for the reason why the arrowroot tasted sweet on your tongue," she added. moment the starch touched the tongue, began to ooze out from the tongue itself call this fluid *saliva.* You, of course, kno readily it begins to flow at the very tho something nice. We say our mouth wate

"This saliva from the tongue acted on the starch, just as the acid acted on the other starch in the dish. It *changed the starch into sugar.* All the starchy matters which we eat must be changed into sugar by the saliva, or they cannot become food in the body.

"I have now a spoonful of sugar, which I will hold over the flame of the spirit-lamp.

The sugar, you see, soon becomes heated, and burns, and in burning it gives out great heat.

"So, then, starch taken into the body as food must be changed by the saliva into sugar; and it is the sugar thus formed which becomes a fuel-food, for it is burned in the body, and produces heat and force.

"You should also carefully remember that we prepare, and use sugar itself, from the sugar-cane, beet-root, maple, maize, and other plants; and that many vegetables and all fruits contain sugar. Even in milk there is a certain amou of sugar, which is called milk-sugar.

"Sugar of every kind becomes a fuel-fo when it is taken into the body. It is burned u to produce bodily heat and energy."

Summary.—The heat-giving substance in the corn-grains, as we as in peas and beans, is starch. Starch is found, more or less, in a vegetable food. Starch is changed into sugar by the action of th saliva; the sugar burns in our body and becomes a fuel-food.

FLESH-FORMERS—ANIMAL SUBSTANCE

"We are going back to the hen's egg to-day girls," said Miss Brown, when the class next met. "I have an egg here; I must make it teach us something new now.

"I will break the egg in a cup as I did before. The yolk, as you know, consists largely of the oily fuel-food, which is to give the little chick warmth and energy. But our business now is not with these fuel-foods, so I will remove the yolk altogether.

"Notice the clear, sticky liquid that is left in the cup; and notice, too, the change that takes place, when I pour it into boiling water. It changes to a white, opaque, solid substance. We call it *white of egg*. The learned name, *albumen*, is given to it, because of this white *appearance*. The Latin word *albus* means *white*.

"This albumen is the very stuff, which the little chick used to build up its body. It is commonly called a *flesh-forming food.* But I want you carefully to remember that the little chicken's body is not made entirely of flesh. It contains bones, skin, beak, tiny feathers—everything to make a complete body.

"Whenever, therefore, we use the word flesh-formers, you must say to yourselves—'These foods do not make flesh only, but all parts of the body.' I daresay you are now beginning to understand why I called the egg a perfect food.

"There is one other thing I want you to remember, and that is, that this substance—*albumen*—is not found in eggs only, but also in the *blood and flesh of all animals.* It is also met with in the *corn grains,* and other *vegetable food.* It stands first among the flesh-formers, both for the amount of nourishment it contains, and for the ease with which it is digested.

"Let us next turn our attention to Nature's other food—milk. I have some new milk in this glass. I will pour a little of this rennet into it, so that you may observe the change that takes place. It curdles at once into a white, opaque, solid substance—*the curd.*

"This is the *flesh-forming material of milk.* It is with this substance that the young sucking calf builds up its body.

"*It is important* to remember that the food, which every animal seeks for itself, must contain flesh-forming matter of some kind, because its body has to grow, and it can only be formed from that kind of material.

"Let us next deal with the flesh of animals, taking a piece of lean beef as our starting-point. You have already been told that a piece of newly cut lean beef, fresh from the butcher's shop, contains more than three-quarters of its weight of water. We will try and learn something now about the solid part of the meat.

"The piece of beef has a red appearance, owing to the blood which it contains. We can easily get rid of the blood, by washing the flesh in water, and it will then be seen to consist of a mass of whitish threads or fibres, with little particles of fat here and there.

"If this be put into spirits of wine, the fat will all dissolve out of it, and nothing will remain but the fibrous substance, which is the chief solid material of the muscles, or lean flesh of animals. It is commonly called *fibrin;* but learned people give it another name, *myosin.*

"When we eat meat, it is this part of it which becomes *flesh-forming food.*

"You must remember that, although we have spoken only of beef, the nature of all flesh-food is the same. Still the value of each depends largely upon the ease with which it is digested.

"Mutton, venison, poultry, and game are easily digested; beef, though it contains much nutriment, requires a more robust digestion; pork and veal are less digestible than either.

"We must not leave this part of our subject without a word or two as to the high value of the bones as food material. This is a fact which is unfortunately too little known. In many homes the bones are discarded, and thrown aside as useless. This is a great mistake.

"You, of course, remember the gristly substance which was got by soaking our bone in spirits of salt? This part of the bone, when boiled, yields a glue-like substance, called *gelatine*, which is *a very valuable flesh-forming food*, and makes most nutritious soups.

"While considering the bodies of animals we must not pass over fish. The fleshy part of all kinds of fish consists practically of the same material—*fibrin*—as that which makes up the bodies of other animals, except that it contains more water in proportion to its weight, and therefore less nutriment. It is as a rule, however, easily digested, and makes excellent food."

Summary.—The name *flesh-former*, as applied to certain foods, is misleading. It is given not to those only that make flesh, but to all materials that build up any part of the substance of the body. In the flesh itself it is known as *fibrin* or *myosin*; in the bone it is a glue-like substance—*gelatine*; and in the blood it is *albumen*, a substance exactly like the *white of egg*.

FLESH-FORMERS—THE GLUTEN OF THE CORN GRAINS

"I was very pleased the other day, Norah, to find that you had not forgotten the way to separate the starch grains from flour," said Miss Brown. "You shall now come and do it for me, as we did it in our earlier lessons."

Norah came up to the table at once, and was soon busy squeezing and kneading the dough in the muslin bag.

"That will do," said Miss Brown at last. "The water in the basin is quite white and milky-looking with the starch. Now open the bag, and see what is left behind in it.

"You see, girls, we have now in the muslin a white, sticky substance, something like bird-lime. This we call *gluten;* and it is very much the same kind of substance as the *albumen, myosin, gelatine,* and *curd,* which we have already met with in the different animal foods. It is a *flesh-former.*

"The flour consists mainly of these two materials, *gluten* and *starch.* The starch is in the water; the gluten is in the muslin bag.

"Here are some grains of wheat. Let us cut them open and examine them. The middle of the grain, you observe, is white, and this white part is enclosed in an outer covering or skin.

"The white, inner substance is *starch;* it is the outer covering of the grain, which contains the flesh-forming *gluten.* The gluten is always found just beneath the outer skin of the grain.

"The miller, after grinding the grain, passes the meal through a number of sieves. The first sieve separates the larger particles from the rest. These are really portions of the outside skin, and are sold as *bran.* The second sifting separates some finer portions of the same skin, which are known as *pollard.*

"That which remains after this sifting, is the best of the meal, for *it contains all the gluten.* It makes good, wholesome, brown bread.

"Many people, however, prefer white bread; and hence the meal is sifted again and again, the result being that much of the gluten is separated from it, and the flour is white, only because it has been robbed of some of its gluten.

"You will now understand that, although the miller may call this *best wheaten flour,* and *best whites,* it is far from being equal in nutriment to the browner, unsifted, *whole-meal flour.*

"The whole-meal of wheat contains as much as 12 per cent of gluten. By this I mean that, in every 100 pounds weight of the meal, there would be about 12 pounds of gluten. The proportion of gluten in the flour is lower after each sifting, so that the fine wheaten flour does not usually contain more than 10 per cent of gluten.

"The different qualities of wheaten flour in the market are known as *brown meal*, *households*, *fine households*, and *best*. I have already told you that this last makes the whitest bread, but is it really the best?

"Wheaten flour is used by everybody in England, but in Scotland it gives place to oatmeal—that is the meal, or flour, of ground oats. Oatmeal is even richer than wheaten flour in gluten, for it contains as much as 16 per cent of this flesh-forming substance.

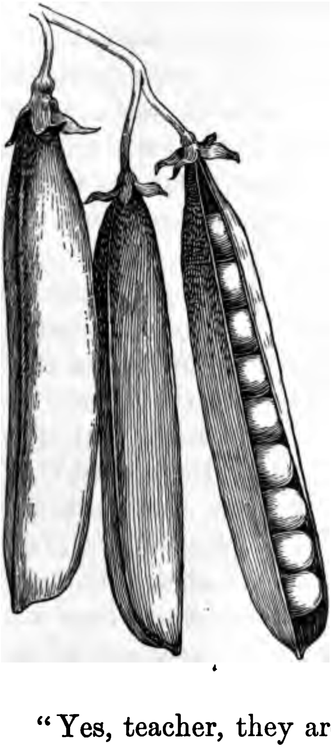
"Barley-flour, or barley-meal, as it is called, contains about the same proportion of gluten as wheaten-flour, but is coarse in flavour and colour. It is not made into bread in these islands; the farmer uses it for feeding cattle and pigs.

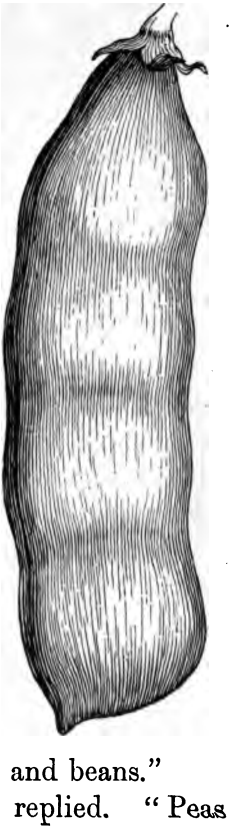
"It is for the same reason that rye-flour is never made into bread in this country, although in Germany and Russia it forms the principal food of the poor. The dark, heavy bread made from it, is commonly known as black bread."

Summary.—The flesh-forming matter of the corn grains is called gluten. It exists just under the outer skin of the grain. Whole-meal flour contains more gluten than best whites. Oatmeal is rich in gluten.

FLESH-FORMERS—THE LEGUMEN OF PEAS AND BEANS

"You all know what these are, girls," said Miss Brown, as she held out her open hand before the class.





"Yes, teacher, they are peas and beans."

"Right; so they are," she replied. "Peas and *beans are important* articles of food. We are now going to examine them, and see what we can learn about their value as food material.

"Have you ever eaten some fresh, young, green peas? If you have, you can tell me how they taste."

"Yes, I have," said Norah, "and I remember they always taste very sweet."

"That's quite true, Norah," replied Miss Brown. "Now, I have here some pea-meal. I will mix it into a paste with warm water, and you shall hold a little of the paste on your tongue, as you did the arrowroot the other day."

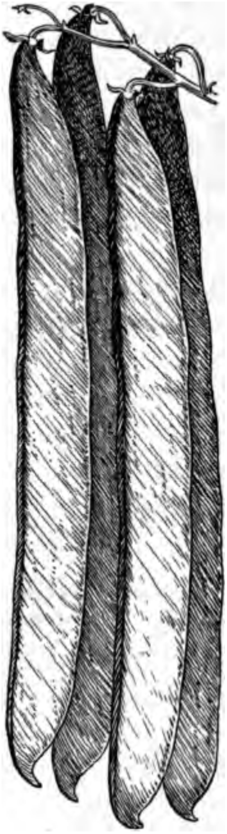
Norah did so, and in a short time she was in possession of the whole secret.

"I know what you wish me to find out, teacher," she said. "The paste soon began to taste sweet. That, I suppose, proves that there is starch in the pea-meal. The saliva from my tongue turned the starch into sugar, and it is the sweetness of the sugar that I can taste."

"Capital," said Miss Brown; "and now you know why the young green peas always taste sweet. Peas and beans of all kinds, like every other vegetable food, contain starch.

"They are all less valuable, however, for the starch which they contain, than for another substance of which we will speak next. Indeed, they contain less starch in proportion than any of the corn grains.

[hey all contain nearly a quarter of their t of a valuable flesh-forming substance, hing like the gluten e corn-grains. That say, they contain more forming matter than ther food we have ex- d—wheaten-flour, oat- eggs, milk, or butcher's



Ve sometimes speak of and beans by the one on name—*pulse*. The name for pulse is *ıen*. This name is now by learned men to be, not the pulse itself, ıe flesh-forming matter it contains.

Legumen resembles the *ı* of oats rather than ɔf wheat. Pulse meal, ıgh it contains so much nent, will not make spongy bread; and in ɔountries where it is eaten, it is prepared in the form of cakes.

t is somewhat to be deplored that we, in ınd, do not make as much use of this highly nutritious food as it deserves. In some count peas and beans form a very important item of daily diet.

"It would be an immense boon to our peo and especially to our poor, to learn the real v of these leguminous foods. Efforts in this di tion have been made in some districts, by ope public soup-kitchens during the winter mon By making good use of pulse in the prepara of the soups, it has been easy to provide a g substantial dinner for a mere trifle. The rea is that peas and beans provide as much nutrin as butcher's meat, but at far less cost.

"The legumen, when separated out from seeds, is found to be very similar in chara to the curd of cheese. Indeed, it is a cur fact that the Chinese actually make a kin cheese from the legumen of peas."

Summary.—Peas and beans contain a flesh-forming substance legumen. They are valuable foods.

Mineral Food

"You, of course, remember the bone, that been burned in the fire, girls," said Miss Bro "I have a similar one now to show you.

"You know it is very brittle indeed; I easily crush it up in my fingers. It is not ac bone now, for all the animal material has l burned out of it, and nothing is left but the earthy or mineral matter.

"I want you to remember that there is very little of this mineral matter in baby's bones. They are more like this bone."

As she spoke she picked up another bone, which had been soaking in spirits of salt. This she bent and twisted, to show them how flexible it was. She rested one end of it on the table and pressed on the other end, and the bone (such as it was) at once bent out of shape.

"Baby's bones, then, are something like this," she added, "and all because they have not much mineral matter in them. Instead of being hard and firm like ours, they are easily bent.

"That should point out to you, as little mothers at home, the importance of using every care in nursing and handling the dear little thing. The least roughness or carelessness would be enough to bend or twist its bones, and so cause it to grow up a mis-shapen cripple.

"The bow-legged men and women, whom we sometimes meet, are only so because they were allowed to stand, before their baby bones had been hardened with mineral food.

"Now let us look at this burnt bone again. I will crumble some of it up in my hand, and you see it looks like a sort of white ash. The bones of animals, when burned and crushed, make a substance, known as *bone-ash*, which is put to many useful purposes.

"This substance contains two minerals, *lime* and *phosphorus*, and as neither of these minerals existed in the bone at first, it is clear that both must have come from the food. We may call them *bone-makers*.

"I daresay you remember that, some time ago, we agreed to call water a mineral food, first because it came out of the ground, and also because we could not place it either with the animal or the vegetable substances. I will now show you another reason for so calling it.

"You know that water, as it trickles through the earth, dissolves lime, phosphorus, and other minerals, and carries them away. It is this, which makes all the difference between the water we drink, and the soft rain-water, which falls from the clouds.

"Look at the difference between the water in these two glasses. One glass is filled with drinking water, the other with rain-water. The drinking water is bright and sparkling, the other looks dull and flat.

"Taste them, and you will find that the drinking water is refreshing to the taste; the rain-water is not nice to drink; it is flat and soft and tasteless.

"It is the dissolved mineral matter in the rinking water, that makes all the difference; ere is no mineral matter in the rain-water.

“But you must not think that the water, hich we drink, is the only source of our mineral od. Salt, as you know, is a most important ineral food. Neither we ourselves, nor any ther animal, could live without salt.”

“I remember father once told me that even wild imals of the forest seem to know they must ave salt, for they often go many, many miles find it for themselves,” said Norah.

“That is quite right, Norah,” said Miss rown; “and it is a curious fact that salt is e only mineral food, which we choose for our-lves, and take knowingly. And now,” she dded, “I expect you will want me to explain hat I mean.

“You know, of course, that we take salt on ur plate at all our meals; we seem to crave r it; we do not relish our food without salt.

“But we do not put any other mineral on ur plate at meal-time, and yet we take minerals every meal. Let me tell you how it is.

“All the fresh vegetables we eat, such as otatoes, cabbages, peas, beans, and others, con-in mineral matter. These things once grew as lants in the ground, you know. As they grew, heir roots absorbed these mineral matters from *e soil. Hence* it follows that we take mineral food, of some kind, without knowing it, in all fresh vegetables we eat.

"Curious enough, it is just the same fruit. All fruits contain a sort of salt, as as sugar, and this salt they got from the soi the same way as the green vegetables got the

"Indeed, I might go on further and fur and tell you that the flour of the corn grains contains mineral matter, derived from the so the same way; that there is mineral matte milk and eggs, and even in the meat that co from the butcher's shop."

Summary.—A bone when burned in the fire yields a substa bone-ash. This consists of all the mineral matter of the bone—c lime and phosphorus. We sometimes call these minerals bone-m Fresh vegetables are the principal source of our mineral foods.

A BRUSH-UP

When the girls next met, Miss Brown surpr them by saying that she had nothing new to t them that day. "The fact is," she said, "I very anxious that you should not forget anyt of what I have already taught you. It is this reason that I am going to ask you to me run over the old ground once more. shall then be able to pick up the main facts, *arrange them* in order, so that it will be eas *the future to* keep them in our memory.

"In the first place, why do we require food at all?" she asked.

"We require *flesh-forming food* to build up the body, and repair the waste caused by the work we do," said Norah.

"Then, too, we must have *fuel-food*," said Nellie, "to warm the body, and provide force and energy to make it work."

"And without *mineral food* our bones would never get hard and strong," said Maggie. "Instead of being firm and rigid, they would be so flexible that they would easily bend."

"Quite right, girls," she replied; "we must have *flesh-formers*, *body-warmers*, and *bone-makers*, every day of our lives. I have here on the table a great many different articles of food. You shall help me to arrange them, as we did once before; only this time I want them arranged not as animal foods and vegetable foods, but as *flesh-formers* and *body-warmers*. Norah shall commence with this loaf of bread."

Norah took the loaf, but you could soon see she was completely puzzled. She made one step towards the table, where the body-warmers were to be placed, and then she stopped short. A thought had just flashed through her mind. She half turned to the table set apart for the flesh-formers; but again she came to a stand-still.

"*What is the* matter, girls?" asked Miss

Brown; for all the girls were as much puzzled as Norah was, although they could not help laughing to see her in such a fix.

"I don't know whether to call the bread a flesh-former or a body-warmer," replied Norah. "It contains starch as well as gluten."

"So it does, dear," said Miss Brown. "Indeed, it contains quite six times as much starch as gluten, perhaps a little more; so that it is both a body-warmer and a flesh-former. You might divide your loaf into seven equal parts, put one part on this table of flesh-formers, and all the rest on the other table among the body-warmers. That would represent to you the amount of each kind of food in the loaf."

"But how could we represent the mineral food, teacher?" asked one of the girls.

"That is a very good question to ask," said Miss Brown. "I ought to tell you that the amount of mineral food we require is not great, neither is the amount to be met with, in any kind of food, great. A small spoon would easily hold all the mineral matter in this loaf.

"It is just the same with the flour of all the corn grains, and indeed with most of the other articles of food, as it is with bread," she added. "If we take this piece of beef-steak, for instance, we cannot place it among the flesh-formers *altogether; because* although it contains a large share of flesh-forming matter, it also contains fat, and fat, as you know, is a body-warmer.

"Peas and beans, again, contain a large amount of flesh-forming *legumen*, but they also contain *starch*, and therefore they are heat-givers, as well as flesh-formers.

"Even cheese, which you know is made from the *flesh-forming curd of milk*, carries away with it some of the fatty cream. Only the very commonest of cheese has no cream in it, and this is because it is made of milk that has been skimmed. All ordinary cheese, therefore, contains heat-giving as well as flesh-forming food.

"Eggs and milk of course belong to the same class of food. You know I have frequently spoken of them as Nature's foods. They are heat-givers as well as flesh-formers.

"Butter, on the other hand, which is made entirely of the fatty part of the milk, is simply a heat-giving food. So, too, are sago, arrowroot, tapioca, corn-flour, rice, and a boiled mealy potato; for they are all starch foods."

OUR DAILY FOOD

"I want you to think once again about eggs and milk, girls—Nature's perfect foods, as we *have called them*," said Miss Brown. "They are perfect foods, because they supply, in themselves, all that is necessary to support life.

"By carefully considering these two foods, we may learn what our own daily requirements are. It is found that a man, doing an ordinary day's work, requires about four times as much heat-giving as flesh-forming food, or his body will lose in size, weight, and energy.

"No single article of food supplies heat-givers and flesh-formers in exactly this proportion, and hence it has been found the wisest course to use one kind of food with another. Let me explain.

"Suppose a man could get nothing but lean meat. He would be obliged to eat 6 pounds of this every day of his life, to get the necessary amount of fat as a heat-giver. But this enormous quantity of meat would give him ever so much more flesh-forming matter than he required, and he would soon become very ill, because some parts of his body would be overworked in trying to get rid of it all.

"But if he could have some starchy food such as potatoes, or bread, to eat with his meat, that would give him all the heat he wanted, without compelling him to take such a large amount of flesh food.

"On the other hand, suppose he tried to live altogether on potatoes. The poor fellow would have to eat no less than 13 pounds of potatoes, day after day, in order to get the necessary amount of flesh-forming gluten.

"And he would only be able to do it then, if the potatoes were boiled in their skins, and carefully peeled, so as to remove nothing but the thin skin itself, because the small amount of gluten, which the potato contains, lies just under the skin. I have already told you that a mealy potato, that has been peeled and boiled in the ordinary way, is all starch. Its gluten is in the peelings, which have probably been thrown away.

"Just think what an enormous amount of starch food the poor man would have to eat, and what an amount of extra work that would throw on some parts of his body. Thirteen pounds of potatoes every day! Why, the poor man would soon be dead.

"It would be impossible for any one—man, woman, or child—to remain healthy and strong with only a single kind of food from day to day. We must use one food with another, so as to get a mixed diet."

"But are there not some people, teacher, who never eat meat, and live entirely on vegetable food?" asked Norah. During the last few minutes she had been thinking, for she had often heard about vegetarians.

"Yes, Norah, you are right in what you say," replied Miss Brown. "But I am afraid you are forgetting something. All vegetable food is not of one kind. You know that peas and beans contain a large amount of flesh-forming matter, as well as starch; and so do the corn grains, and the meal made from them.

"These vegetable flesh-formers are as good as those obtained from meat, if they are properly prepared, so as to make them easy to digest.

"I think," she continued, "from what I have said, it will be easy now for you to understand, not only why we eat potatoes and bread with our meat, but why bread and butter, bread and cheese, bread and treacle, eggs and bacon, bacon and beans, always go together to make a meal.

"A little thought in the same direction will show you why mother always puts suet with the flour to make a pudding; why eggs, milk, sugar, and butter are always added to such things as rice, sago, and tapioca. These three are starches, and if we attempted to live on them alone, they would not do us much good."

Summary.—To keep the body in health it is necessary to use one kind of food with another. A mixed diet supplies the amount of all the materials we require, without overworking the organs of digestion.

FOOD AND CLIMATE

When the girls next met, they could only sit and look at each other, and ask in whispers "What are we going to do now?"

Miss Brown had placed a large globe on the table, and of course they all thought they were going to have a geography lesson. One of them at last ventured to ask her whether it was so.

"Well, it is not to be exactly a geography lesson, girls," she said. "The fact is, in dealing with food thus far, I have had in my mind only the people of this country, and those who live in a climate similar to our own.

"I want to impress upon you to-day the fact that food, which is suitable for one climate, is altogether unfitted for another. People in different parts of the world have to choose their food, to suit the climate in which they live. "This globe, as you know, represents the world. This part of it round the North Pole is called the Arctic region. We have often spoken of it as the cold, frozen

North. There is a similar part round opposite or South Pole of the world.

"The rigour of the climate prevents people, who live in those regions of the wc from doing much actual work, so that ther not a great deal of bodily wear and tear. T are chiefly concerned in keeping up their ir nal fires. They must have immense quant of heat-giving food, but do not require a l amount of flesh-formers.

"You, of course, remember the Esquim family, taking their meal of raw blubber, washing it down with huge draughts of sea or whale-oil. These people think nothing eating seven or eight pounds of blubber eac a single meal, and they actually want it.

"You remember our piece of fat on the how fiercely it burned, and what a great am of heat it gave out while burning?

"That explains why this blubber fat is the food for these people. It keeps their inte fires going well; and a very small amoun flesh-forming food is all that is then necess because they do very little work.

"Now look at this part of the world," said, as she drew two chalk lines round globe, so as to enclose all the middle of i *a sort of* belt.

"*All the* hottest countries of the world situated between these two lines. The people in these parts can do very, very little work indeed, owing to the intense heat, and so their bodily wear and tear can only be small.

"They could not eat fat and drink oil; such food would kill them. In fact their very stomachs would turn against it. They very seldom think of eating meat of any sort.

"Rice is their chief food; it is to them what bread is to us. But rice, you know, is remarkable among the corn-grains for the very small amount of gluten it contains. Even the undressed rice, or paddy, such as they eat, contains only a very small proportion of gluten just under the skin. Yet this is quite sufficient flesh-forming material for people who do so little work."

"But isn't the starch in the rice a heat-giving food like fat?" asked Nellie. "I can't understand how they can eat the starch, any more than the lump of fat."

"I am glad you have asked this question, Nellie," said Miss Brown. "You remember, I daresay, that when we put the corn grains on the fire, they did not blaze away fiercely, and give out great heat, as the fat did. They burned, it is true, but slowly, and with less heat.

"It is for this very reason that rice is just the mild sort of fuel-food, suited to the people *of those hot lands.* Their bodies require some amount of heat and force; and the starch of th rice is able to supply all that is wanted. Oi and fat would give too much heat.

"Now, lastly," she said, as she ran her hand over the two broad belts on the globe, between the very hot and the very cold regions, "I want you to think about this part of the world. Here it is neither too hot nor too cold for work. The people who live in this part of the world are strong and vigorous, and can work hard.

"As they work hard, their wear and tear must be greater than that of people in either the very hot or the very cold lands. These people require more flesh-forming food; they eat more lean meat than any others.

"I need scarcely tell you that our own country, England, is in this region of the world, and for real, hard, muscular work, the Englishman has probably no equal anywhere. He eats well; but then he also works well."

Summary.—People in cold climates require abundance of fuel-food. Their food consists largely of fat. Such food would be unsuitable for people in tropical regions.

Sources of Animal Food—Meat

"We have been engaged so far," said Miss *Brown,* "in finding out the nature and purposes *of food.* *Our* next business will be to learn nething of the sources, from which we draw our supplies.

"We shall begin with meat, because in this ntry meat is considered a very important cle of food. There are very few English people, do not take meat at least once a day, if they afford it; and not only our towns, but even little villages have their butchers' shops.

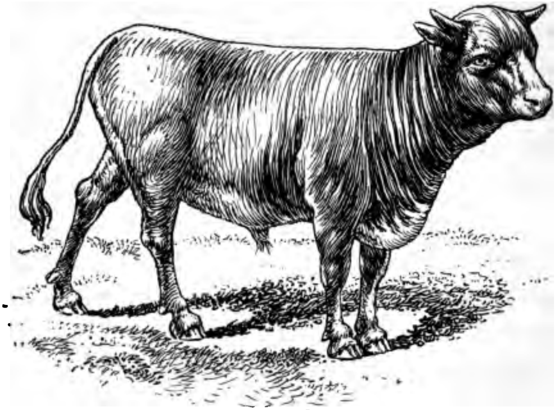
'This is not the case in a great many foreign ls. There the people seldom taste meat, and not understand 'John Bull's' great liking the 'Roast Beef of Old England.'

'One reason why people think so highly of t is that it makes a more tasty meal than t other food. Then, too, as it consists of very same substances as our own bodies, s more easily digested than any other food. s important to remember that only the lean s of the meat supply flesh-forming food; then the fat is the very best of heat-givers, in a climate like ours we are able to eat fat.

'The flesh of the ox is called beef; that of calf is veal. The sheep supplies mutton lamb; the pig pork and bacon. Each of se has its own distinctive appearance and our, and may be easily known.

"Beef, the flesh of the ox, is more nutritive n any of the other meats, as it contains more *h-forming matter* and less fat, weight for weight, than they do. Much depends, however, on the age of the animal, and the way it has been fed. Young meat is flabby and watery; old meat is coarse in texture, juiceless, and tough. The butcher considers an ox in its prime condition when it is about four years old.

"Good beef should be a bright red colour, and the streaks of fat intermingled with the lean should give it a sort of marbled appearance. When cooked it should be juicy, and of a rich, strong flavour.



NORFOLK SHORTHORN BULL.

"Such meat is the best and most nourishing food for healthy, robust people; but delicate persons cannot digest it."

"*I suppose* that is the reason why mother *gave me* beef-tea when I was ill," said Norah.

"Yes, Norah," replied Miss Brown, "it is. In the beef-tea you got all the nourishment of the beef, with less trouble in digesting it.

"Now, let us turn our attention to veal—the flesh of the calf. You have, of course, seen veal hanging in the butcher's shop, and you know that it is lighter in colour than beef. The butcher aims at making the flesh as white as possible, and to do this he drains it of its blood. This makes the meat not only juiceless, but also one of the most difficult to digest. It cannot be ooked upon as a nutritious food, and yet many people regard it as a luxury.

"Mutton is not so coarse in texture as beef, t the same time it is more tender, and therefore more easily digested. It is a very suitable food or people who do not get much open-air exercise. Boiled mutton, divested of most of its fat, makes good food for the sick-room.

"Wether mutton, about three years old, is considered very choice meat. The best parts of the animal are the leg and shoulder.

"Lamb, although tender and sweet, and generally regarded as a luxury, contains less nutriment, because, like the flesh of all young animals, it is watery and somewhat flabby. It is always dear, and far from economical.

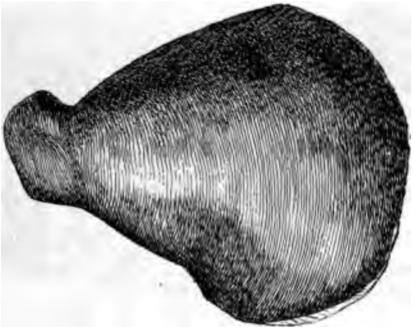
"Pork, the flesh of the pig, is not so wholesome or nourishing as either mutton or beef, and the large quantity of fat makes it diffic to digest. In spite of this, because of its pleasa

flavour, it has been a favo ite article of food in t country for ages. It is a suitable food, however, people who are confi much to the house, a should never be eaten exc by those who are in g health.

"To people who live open-air life in the count it is a very valuable fo They usually eat their p with beans, the beans giv flesh-forming material, wh is wanting in the fat po Fresh pork is best w about six or eight mon old.

"Bacon consists of sides or flitches of the cured in a mixture of s and saltpetre, and then dri and sometimes smoked in the smoke of burn oak saw-dust. Well-cured bacon has a delici *flavour,* and is a favourite meat for breakf *among all* classes.

"The hind-legs of the pig, treated in a somewhat similar way, make hams. Ham is regarded as a delicacy by most people. It is eaten with meats which are in themselves deficient in fat, such as veal, chicken, and turkey."



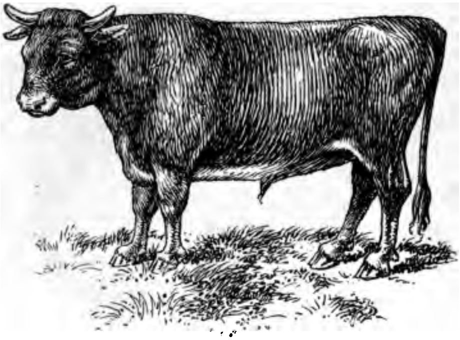
Summary.—**Meat is an important article of food with people in the temperate regions of the world. It is more easily digested than other food. English people are great meat-eaters.**

OUR MEAT SUPPLY

"Nearly all foreigners look on with astonishment at a healthy Englishman's appetite, and especially his appetite for meat. I remember telling you this, when we began to discuss animal food. They regard us as a nation of beef-eaters; and we certainly do eat more meat than any other nation under the sun."

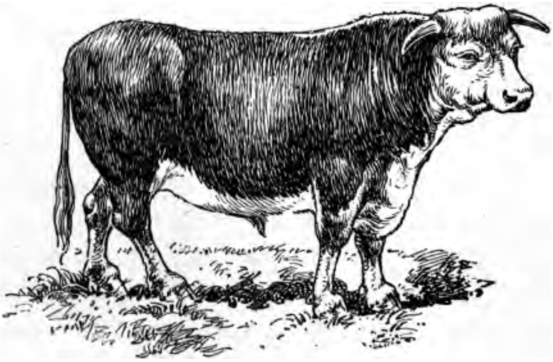
It was Miss Brown who spoke, and this was the way she introduced the new lesson.

"And now, girls," she continued, "we w
make this our starting-point for to-day. As



DEVONSHIRE BULL.

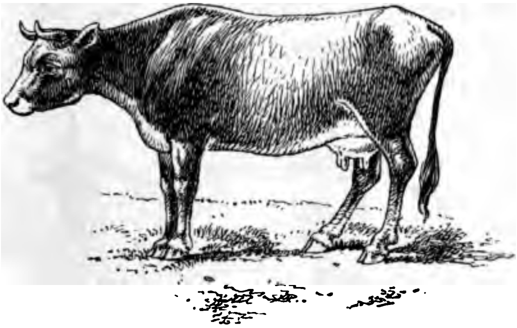
are such great meat-eaters, you will not be su
prised to learn that British oxen and sheep a



HEREFORD BULL.

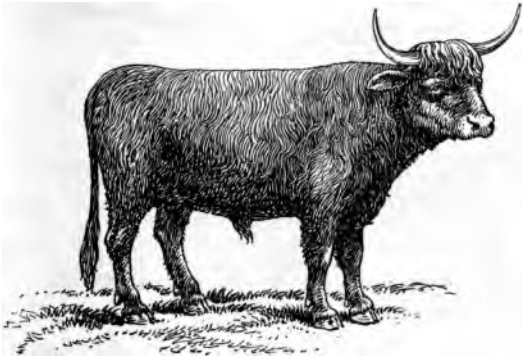
the finest in the whole world. Our farmers a
graziers have for ages made the rearing of cat

and sheep their special study, and the result is that English-grown meat always takes the first place in the market.



ALDERNEY COW.

"We have two distinct varieties of cattle, the short-horns and the long-horns, and each has its own special merits. Among the most highly-prized *breeds* are the Hereford and Norfolk

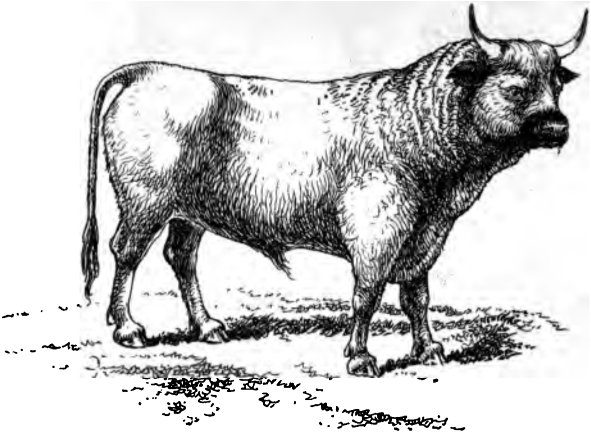


SCOTCH BULL.

short-horns, the Devonshire and Alderney cows and the Scotch cattle.

"The butcher knows the value of his prime Scotch beef. For tenderness and rich juicy flavour it has no equal.

"There is a very curious fact in connection with British cattle. When the Romans were masters of this country nearly eighteen hundred years ago, herds of wild cattle roamed over the land—grand-looking white beasts with black muzzles, their white horns also tipped with black. This same breed of oxen has been preserved pure through all these ages, and may now be seen in Chillingham Park, and one or *two other places.*

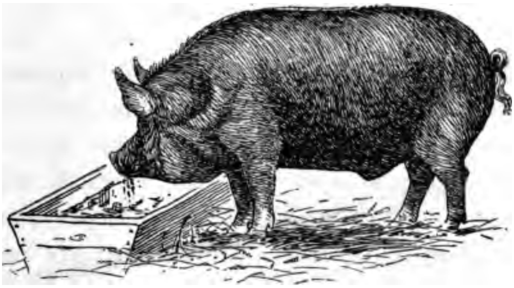


CHILLINGHAM BULL.

"Among the many varieties of British sheep, the South Down breed take the first place. These are rather smaller than many other breeds, and are easily known by their black muzzles and feet. South Down mutton is the richest and choicest in the market.

SOUTH DOWN SHEEP.

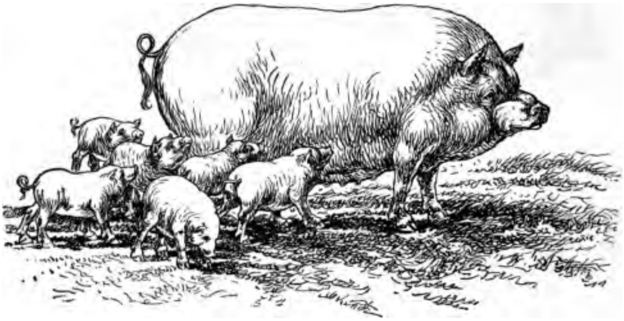
"The pig, as I have already said, has been reared in this country for ages. It is a well-*known fact that* almost every cottager in the



BERKSHIRE HOG.

country has his pig; in fact, he depends to a large extent on the pig for his meat. The Berkshire, Wiltshire and Suffolk breeds are the most highly prized."

"I have often heard father and mother talk about foreign meat, teacher," said Norah; "so I suppose all the meat we see in the butchers' shops is not English?"



SUFFOLK SOW AND LITTER.

"No, Norah, it certainly is not," replied Miss Brown. "Indeed, I expect we more often eat foreign meat than English. The fact is, it would be impossible for our English farmers to produce anything like sufficient meat, to feed all the people of this country, and we have to bring immense quantities from foreign lands.

"We bring shiploads of live cattle from the neighbouring countries of Holland, Denmark, and Germany. The poor beasts are able to stand this short sea voyage without much suffering, and if when they arrive here they are not in good condition, they are often turned out on some rich pasture land for a time, till they are fit for the butcher. In some cases the animals are slaughtered abroad, and the dead carcases shipped to us.

"The immense quantity of meat, dead and alive, brought to England in this way, however, was not sufficient to keep pace with our growing population, and thoughtful men began to look out for some better way of feeding the people.

"They pictured to themselves many far distant lands, where sheep and oxen were reared in hundreds of thousands, merely for the sake of the wool of the one, and the hide of the other animal. The flesh, which would be such a boon here, was of little or no value there.

"The result of their thought and study is, that we now have special fast steamers, fitted up with ice chambers, plying regularly between this country and the far-away ports of Australia, New Zealand, and North and South America, and bringing carcases of beef and mutton, as fresh as when the animals were killed.

"In addition to this supply of foreign frozen meat, we bring in shiploads of 'tinned meat.' The meat is boiled and packed in tins, and after all the air and moisture have been driven out, the tins are closed up with solder, so as t make them air-tight. Sealed up from the actio of the air in this way, the meat will keep goo for any length of time, and makes wholesom cheap food for thousands of our poor, who woul otherwise very seldom taste meat.

"This tinned meat, too, is very largely use on board ship. Our sailors, who used to suffe severely from scurvy, through having to depen upon salt junk, can now get fresh meat, and, a a consequence, the disease is very rare.

"It should never be forgotten that the art c preserving meat in both these ways has been boon to the producer as well as the consumer *millions of tons of* meat, instead of being waste in foreign lands, as they once were, are now brought here, to serve as good wholesome food.

"We also bring vast quantities of foreign pig-meat to this country, mostly in the form of bacon. North America is the great swine-breeding region for almost the whole world. It was estimated that, in the year 1890, upwards of five million hogs were killed and dressed for the market in the great slaughtering yards of North America."

Summary.—British oxen and sheep are the finest in the world; but we import immense quantities of meat from foreign parts, both as live cattle, frozen carcases, and "tinned" meat.

POULTRY AND GAME

"If you please, Miss Brown, will you tell us why some birds are called game and some poultry?" asked Norah.

She and her two cousins had been looking at some beautiful birds hanging up in the poulterer's shop, and Mr. Maggs himself had told them that these birds are called pheasants; they are not *poultry*, but *game*.

"Yes, girls, I will," replied Miss Brown. "Suppose we take poultry and game as our next subject.

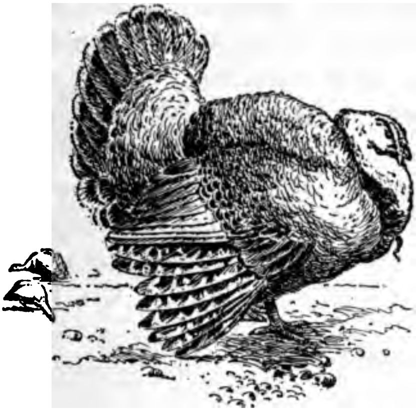
"When we speak of poultry we mean all those tame birds, such as ducks and geese, fowls, pigeons, and *turkeys, which* are reared in the farmyard.

"Those included under the head of game are wild birds, such as pheasants, partridges, and grouse. They live in the woods and fields, and are protected by law, no one being allowed to kill them without a licence.

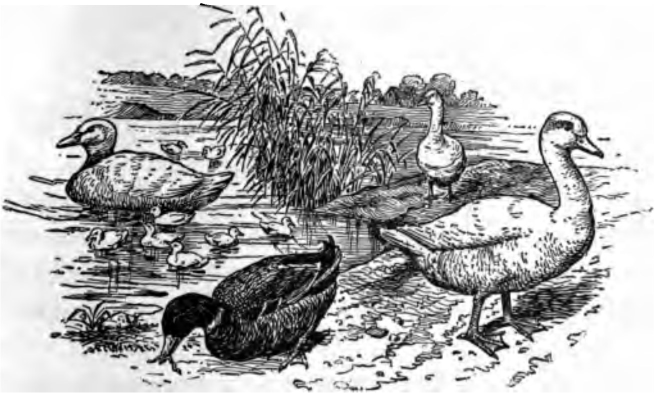
"Those who are allowed to kill them do it not for profit, but for sport and exercise, and this will explain why the name *game* is given to these birds. It will at the same time explain why deer and hares are also called *game*. Although they are not birds, they are hunted and killed for sport.

FOWLS.

"The fowl, pigeon, and turkey are white-*fleshed birds*. The flesh contains very little fat, and is very light, delicate, and easily digestible. Chicken provides the best and lightest of all flesh-food for the sick-room.



TURKEY.



DUCKS AND GEESE.

The turkey is a grand bird that figures on the

Christmas dinner table. I expect you have all helped mother prepare the turkey before now.

"Ducks and geese are also great favourites, although they cannot be eaten by delicate people and invalids. Their flesh is dark coloured, not white like that of the chicken.

"They are both water-birds, as you know; and their bodies are very fat indeed, to enable them to swim about at their ease in the cold icy water. This fat makes the flesh difficult to digest; but those who are strong enough to digest it, are fond of its rich delicious flavour.

"In addition to our home supply, we get millions of birds, and hundreds of millions of eggs from France and Ireland during the year.

"Of course, you know you do not see poultry on the table every day. It is too expensive for that; most people have to regard it only as a luxury for special occasions.

"Pheasants, partridges, and grouse, provide very delicate, nutritious, and easily-digested food, each of which has its own special flavour. The pheasant makes its home in the woods and copses; the partridge in the farmer's corn-fields and turnip-fields; and the grouse on the moors of Scotland and the north of England.

"Autumn is the season when sportsmen take their guns under their arm, and tramp the moors, and beat up the bushes in search of these birds. Grouse-shooting on the moors is the first to start. The opening day is always

PHEASANT.

August 12th. Partridge-shooting begins as soon as the harvest is over, when parties of sportsmen may be seen making their way over the corn-stubble, where these birds are to be found.

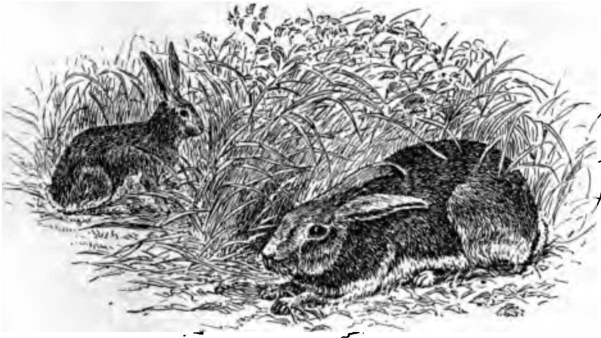
PARTRIDGES.

"Deer and hares, as I have already told yo

are included among the game animals. The flesh of the deer is called venison, and supplies very choice food. On the moors and among the mountains of Scotland, wild deer are still to be found, and they are chased by stalking. But in England there are no wild deer; those we do see are kept for their beauty in the parks of the nobility and gentry.

"Much as we may justify hunting the wild animals among the mountains, the so-called stag-hunt, as it is practised in England, is little short of hard-hearted cruelty. The poor, timid, *frightened* deer, which has been bred up tame in a *park from* its infancy, is taken away in a cart one morning, after having its antlers sawn off; and when it is turned out of the cart miles away, it finds a pack of bellowing hounds and huntsmen at its heels, who chase the poor thing till it drops exhausted. This surely is not humane. Can it be really considered manly sport?

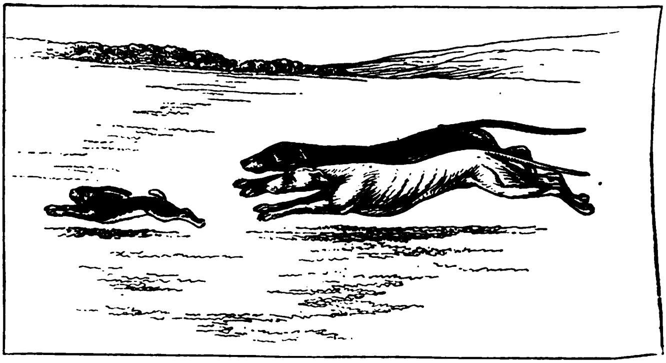
"Hares are wild animals. Their flesh is dark-coloured and of good flavour. It is very nutritious, although somewhat difficult to digest, and is only suitable for healthy people.



HARES.

"Hares are chased by means of greyhounds, which follow their prey as long as they can keep them in sight. This is called *coursing*. They are also hunted by horsemen and packs of other dogs, which have to rely upon the scent for following their prey.

"*Rabbits,* though wild, are not included amongst the game animals. The farmer is allowed to shoot them as he likes on his land. They provide a very light, easily-digested food;



COURSING.

but as the flesh contains scarcely any fat, we usually eat bacon or pork with it."

Summary.—Poultry include ducks, geese, fowls, pigeons, and turkeys—tame birds which are reared in the farm-yard. Pheasants, grouse, and partridges are "*game,*" and deer and hares also come under this head.

Milk, Butter, and Cheese

"We have already had a great deal to say about these products of the useful cow, girls," said Miss Brown, "especially with regard to their nature and composition. You know, too, that we use them in one form or another, at *every meal*; and that for a long time baby has *to depend* entirely upon milk for its support.

"Milk is such a valuable food, so pleasant to drink, and so easily digested, that the doctor often orders it before any other for the sick-room. Yet in spite of this, few foods will so soon go bad. The first thing to keep in mind is that *the milk-jug itself must be spotlessly clean*, for if milk is allowed to stand in an unclean vessel, it will very quickly turn sour and become unfit for use.

"The importance of milk as an article of food at once makes itself felt, if we pay a visit to one of our principal railway stations, at certain times in the day, and watch the great milk-cans unloaded from the trucks, into the carts and waggons of the milk-dealers.

"The cans themselves are slung on bars in the trucks, so that the jolting of the train during the journey may not spoil the milk, and each dealer's cart or van brings in the empties, to be taken back to the farms by the next train.

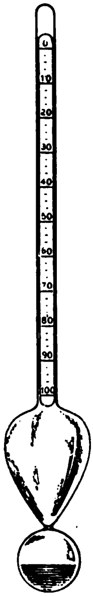
"It is estimated that London alone, with its five million inhabitants, consumes no less than thirty million gallons of milk every year. Picture to yourselves all this milk, from the time it leaves the farmer, to the time when it appears on our breakfast tables, and you will get some idea of the enormous number of people, who must be engaged in the milk trade in London alone.

"*It is* an unfortunate fact that dishonest *shop-keepers* tamper with the milk. Instead of selling it as they receive it, they often mix water with it to cheat their customers.

"I have here a small glass instrument called *a lactometer*, which has been made on purpose to find out whether the milk is pure or not. The tube, you see, has one hundred equal divisions marked on it, the mark for 100 being at the very bottom, the 0 almost at the top.

"If I place the instrument in water, it at once sinks down till the mark 0 is just on the surface of the water. Now notice what happens when I take it out, and put it into milk. The tube now floats so high that the mark 100 rests on the surface of the milk.

"This clever little instrument has been the means of preventing dishonest people from cheating their customers; because the policeman can at any time go into a milk-man's shop, and test the milk he finds there. If the tube sinks, he knows that the milk is not pure, and he knows, too, how much water has been added to it.



LACTOMETER.

"Just as English cows are the finest in the world, so English butter can hold its own against that of any other country. But the amount which our farmers are able to produce is not nearly sufficient for our wants; and we import over a million hundredweights of foreign butter every year, mostly from Holland, Belgium, Brittany, Ireland, and the Channel Islands.

"But even this enormous quantity is not enough to supply our wants; and cheap imitations of butter are now made from the fat of animals. These which are known as *butterine* and *margarine*, are worked up to look so much like real butter, that it is often impossible to tell the difference; and although there is not a particle of butter in them, they are quite wholesome. Indeed they are certainly better than bad butter, and make a very useful, because cheap, addition to the table of the poor.

"*Our English* cheese, like English butter, is *best the* world supplies; but our wants are great that we have to import as much foreign icese as butter. Holland, Belgium, France, witzerland, Canada, and the United States ovide our largest cheese markets.

"Among English cheeses, Cheshire stands st; but Cheddar and Stilton are also great vourites. All these are made of entire milk.

"Gloucester and double Gloucester cheeses e made of a mixture of new and skimmed milk; iffolk cheeses are made entirely of skim-milk. ic Dutch cheese, which we see sometimes in e form of a large ball, and sometimes like ound flat cake, is also made of skim-milk.

"Gorgonzola and other Swiss cheeses are ide of goat's milk.

"Our delicious cream cheeses are made of d *with a large* addition of fresh cream."

Summary.—Milk and its products—butter and cheese—are valuable articles of food. Margarine and butterine are made from animal fat. English butter and cheese are the best in the world.

Fish and the Fishermen

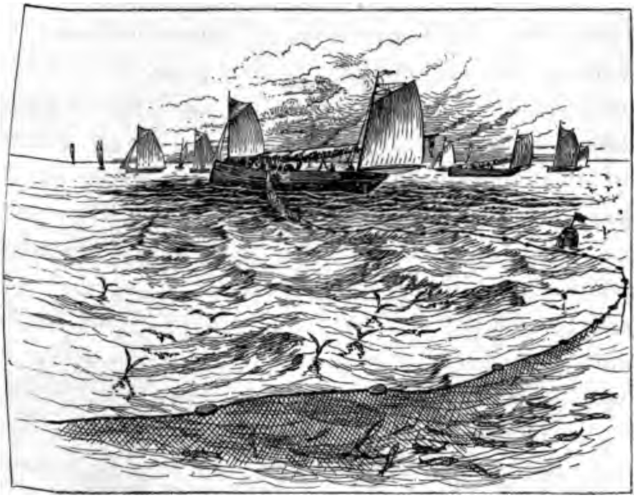
When the girls next met, they found a number of pictures hung up round the room, which at once took their attention. Each one represented a fleet of fishing-boats engaged in their work at sea. The girls were all crowding round the pictures, when Miss Brown entered.

"Ah, girls," she said, "I knew you would like these pictures. Here you can see the reapers of the deep at work gathering in their harvest; and a rich and never-failing harvest it is all the year round, although, unlike the farmer, they reap without the labour of ploughing, sowing, or culture of any kind. Yet few people toil so laboriously, or are exposed to such dangers, as these hardy fishermen.

"Let us look at this picture. The boats here are fishing with the drift-net, which they let down into the sea at dusk, and leave there till dawn, hanging like a wall of network, miles in length, and supported by floats.

"The fish which they catch, such as herrings, mackerel, and pilchards, swim in immense shoals, *measuring* miles across in length and breadth. *As the boats* sail or drift along with the tide to meet the shoal, this wall of network drifts too, and the fish rush on to it, and get their gills entangled in its meshes, which are just large enough for their heads to enter.

"The more the fish struggle, the more firmly they get fixed, and in the morning the nets are drawn in, with their slippery, shining haul.



"Try and picture to yourselves the scene as one of these immense shoals of herrings approaches our shores. The fish always swim near the surface, and their arrival is at once known by the crowds of gulls, cormorants, sea-hawks, and other birds that follow the shoal, as their natural prey, and darken the air for miles round.

"If our eyes could penetrate into the wate as easily as through the air, we should see crowd of larger fish in full chase of the shoal, for th herrings have voracious enemies in their ow element, as well as in the air.

"It is computed that the fishermen of th North Sea take upwards of three billions herrings in the course of the year, and it quite likely that the sea-birds, and the bigg fishes, capture as many more. Yet all thes enemies combined do not probably remove mo than one in a hundred. What visions of the se and its countless multitudes of finny inhabi ants spring up in the mind, if we give o passing thought to such a fact as this; f remember, every part of the sea is alive with i own special fish.

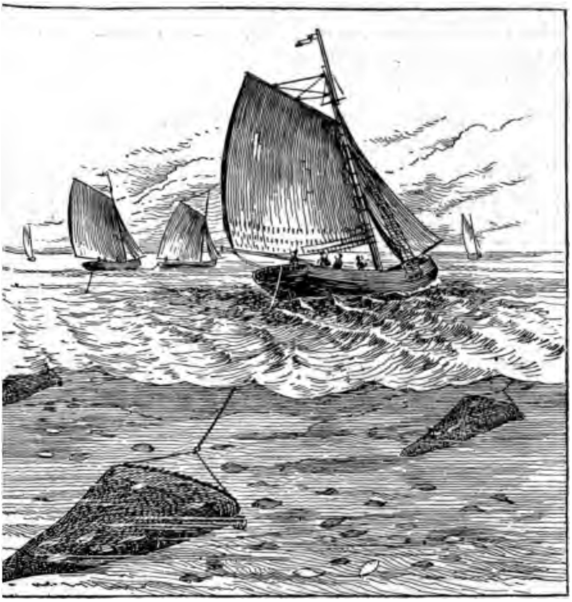
"Now let us look at the next picture. Th boats here are called trawlers; they are trawlin This great net, like a huge nightcap, 'trails' '*trawls*' along the sandy bottom of the se usually on wheels, as the boat sails along.

"The fish, which the trawler catches, live o these sand-banks at the sea bottom. The sto rope by which the trawl is attached to the bo serves to rouse them up, and then the gre wide-open net sweeps along, and they are hop lessly engulfed in it.

"All night the boats sweep the sand-ba

h their trawls, and at dawn the men haul in great bags loaded with fish."

"You once told us, teacher, that the flat-fish on sand-banks," said Norah. "Are these sort of fish which the trawlers catch ?"



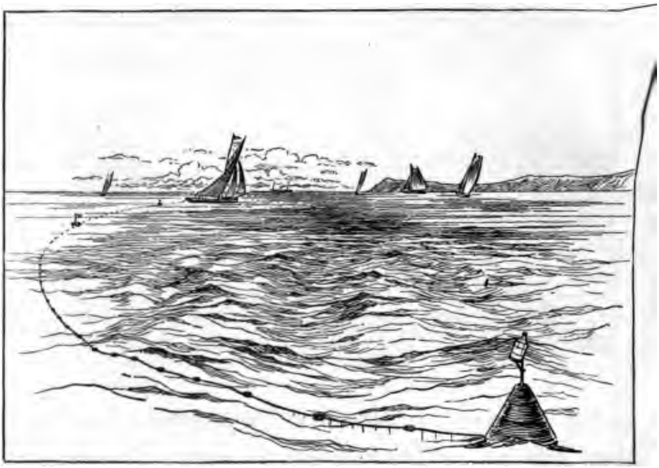
'Yes, Norah, you are quite right," replied s Brown. "The trawl is specially adapted catch these flat-fish—such as soles, plaice, nders, turbot, brill, halibut, and skate.

'The greater part of the North Sea is full of e *shoals or* sand-banks; the largest of them, known as the Dogger Bank, extends for full 300 miles in length. It is the great fishing ground not only for our own fishermen, but fo Dutch, French, and Norwegian trawlers. I literally swarms with fish.

Summary.—Herrings, pilchards, and mackerel are caught with th draw-net; flat-fish (soles, plaice, etc.) with the trawl. The Dogg Bank is our great fishing ground.

MORE FISH AND FISHERMEN

"Now suppose we look at the next pictur girls. Here we see a large buoy floating in th



HOOK AND LINE FISHING.

sea, with a lighted lantern fixed to the top of it. In the distance the smack or fishing-boat is sailing away, paying out a line as she goes.

"The end of this line is attached to the lan- rn-buoy, and smaller buoys can be seen floating intervals to mark each mile of line. Cork ats keep the line on the surface, and about

DREDGING.

very ten feet a baited hook is attached to it by short cord, which hangs down into the sea.

"This line usually stretches six or seven miles rom the lantern-buoy to the smack, and the ooks, which hang down from it into the water, are to catch cod, haddock, ling, and hake; these fish are caught singly, and not with net

"The lines are laid in the early morning, a hauled in towards the close of the day. T men go out in small boats to secure the fish, a as boat after boat gets its load of fish and line the smack is ready at hand to relieve them.

LOBSTER CREELS.

"The seas round Newfoundland teem wit cod, and large supplies come also from the shore of Norway and the Dogger Bank.

"Here we have another picture. The me in this boat are dredging for oysters. Thei great net sweeps along the bed of the sea in ver much the same way as the trawl of the trawler *and gathers* up oysters, mussels, periwinkles whelks, escallops, and other so-called shell-fish, which of course make the sea-bottom their home.

"Here is a picture of another class of fisherman at work. His harvest is crabs and lobsters, which he catches in a sort of trap. It is early morning, and he has just drawn his traps up from the bottom of the sea, where he had sunk them the night before.

"The traps are made of wicker-work. They have an opening in the top, which narrows down so as to form a sort of funnel. Bits of fish and other bait are placed in the bottom, and during the night the crabs and lobsters easily make their way through the opening to get at the dainty morsel. When they attempt to get out again, however, they find the narrow end of the funnel presents only a circle of spikes, and they are hopelessly caught in a trap. These traps are known as *creels* and *lobster-pots*."

"What is that man in the other picture doing, Miss Brown?" asked one of the girls.

"Oh, I know!" replied Norah. "He is shrimping. He has a net at the end of that long pole, and he walks along the sands, and pushes the net through the water before him. Every now and then he empties the shrimps out of his net into the basket, which hangs at his side. I have often seen the shrimpers on the sea-shore."

"*Yes, Norah,* that is so," said Miss Brown.

“But the largest and finest shrimps a
by small trawlers on the sand-banks ou

“You must remember,” she added, ‘
so-called shell-fish, as well as shrimps,
crabs, and lobsters, are really not fish

SHRIMPING.

spite of the fact that they are caugh
sea by fishermen, and reach us through
monger. The first group are really s
animals like the snail and the slug; t
are closely related to the common land

“*I have* one other picture to show y
fisherman, you see, is fishing not in t

in a river—not with a net, but with a rod and line. He is fishing for the grandest and most highly-prized of all fish—the salmon.

"This fish, like all the others we have named, belongs to the sea, and yet, strange to say, it is always caught in the rivers. The fact is, at certain seasons the salmon leaves the sea, and makes its way up the rivers to lay its eggs. It *always chooses* a rapid river, and, in spite of all

SALMON FISHING.

obstacles, pushes on towards the upper reaches of the stream, leaping over rocks, rapids, and cascades on its way.

"The fish are then at their best, and the fishermen of these rivers take such heavy toll, that a large proportion of them never reach the spawning-ground. Some are taken with the rod and line, some are trapped, and some are speared. Salmon-spearing is always carried on by torch-light, for it is a night sport. The glare of the torches serves as a lure to draw the fish to their destruction.

SALMON SPEARING.

"Those, that do succeed in reaching the spawning-place, lay their eggs in the shallow gravelly bed of the stream, and then start on their return *journey to the* sea, but they are then so poor and thin and wretched, that many die before they get back to the salt-water."

Summary.—Cod, haddock, ling, and hake are caught with the hook and line; oysters and other shell-fish are obtained by dredging; crabs and lobsters are caught in traps called creels. The salmon, although a native of the sea, is caught in the rivers.

FISH

"Our pictures have shown us enough to prove the importance of our fisheries," said Miss Brown. "Suppose we now consider the value of fish as an article of food.

"The flesh of fish contains, as I have already told you, the same kind of flesh-forming matter as is found in fresh meat; but it is more watery and therefore not so nourishing and sustaining. It is, however, as a rule, very easily digested; and, above all, it is so cheap as to be within the reach of all classes of people. It is a very valuable brain-making food.

"All fish may be arranged in two classes—the white fish, and the fat or oily fish.

"The white or lean fish include the sole, plaice, flounder, turbot, brill, cod, whiting, and haddock. Their flesh is very white and very delicate, because it contains no fat or oil. This kind of fish is so easily digested, that it forms one of the best of foods for the sick-room.

"*The fat fish* not only contain much oily matter in the flesh itself, but usually have a laye of fat just beneath the skin. The flesh is neve white, like that of the lean fish, and although i is very much richer and more sustaining, it is no easy to digest, owing to the fat which it contains The fat and flesh-forming matter combined mak it an excellent food for the healthy and robust, but it is not fit for people in delicate health. Among the fat fish are the herring, mackerel, salmon, sprat, eel, and pilchard."

"I have noticed that, when mother fries a sole, she puts plenty of melted fat into the pan, but she fries herrings and sprats without using much fat," said Norah. "Is that because one is a lean and the other a fat fish?"

"That is a very clever thought of yours, Norah," replied Miss Brown. "It is quite right, and it shows how useful it is to always keep one's eyes open.

"Now let us take these fish one by one. I daresay I shall surprise you all, when I tell you that the most valuable fish, that comes to our markets, is the herring—indeed, the herring fishery is said to be of greater national value than all the others put together.

"These fish are caught in such abundance that they provide a never-failing source of cheap *and excellent* food for the poor. We eat them *fresh as they* are taken from the sea, and w

re them in various ways for future use.
ome are pickled; some are salted or *bloated* to
ake '*bloaters*'; some are smoke-dried to make
d-herrings; and some again are split open,
lted and smoked to make *kippers*, or *kippered*
rrings.

"The mackerel probably ranks next after the
rring, both in its abundance and also in the
vour, in which it is held by all classes; but
is fish should be eaten as soon as possible after
is caught, as it very quickly begins to decay.

"The cod and haddock are also very abun-
nt, very cheap, and therefore very important
icles of food. The cod is a splendid fish,
netimes weighing as much as forty pounds.

"Its flesh is devoid of fat, as I have already
d; all the fat is stored up in the liver.
mense numbers of these fish are taken every
r for the sake of their oily livers. You have,
course, heard of cod-liver oil. It is given to
ak and delicate people, to serve both as a
dicine, and as a rich, easily-digested fuel-food.

"The haddock is eaten fresh, and it is also
it open and smoked, in much the same way as
herring is kippered.

"Salmon may be justly called the prince of
hes. Its flesh is pink, and of a very delicious
vour, but its high price does not bring it
hin reach of the very poor. Immense quan-

tities of 'tinned' salmon, however, are brought to England every year from the American rivers, and this helps, to some extent, to keep down the price of the fresh fish.

"The whole of the flat-fish, from the delicate nature of their flesh, are favourites with everybody. The turbot and sole, however, are more highly prized than the rest.

"Shell-fish, as a rule, are not very digestible, although their rich flavour makes them favourites with most people. Oysters are an exception to the rest in this respect; they are often ordered for the sick-room, if taken raw.

"Crabs and lobsters, although very delicious, are very indigestible, and can only be eaten by healthy robust people."

Summary.—White, or lean fish include the sole, plaice, turbot, brill, whiting, and haddock. The herring, mackerel, eel, sprat, and salmon are known as fat fish.

VEGETABLE FOODS—THE STAFF OF LIFE

"In spite of all we have said about the value of animal foods, I am sure, if you were asked what food you liked best, you would at once say a slice of bread and butter," began Miss Brown, at the next opening of the class.

"*I wonder* how often you say, 'Please, mother, *ill you cut* me a slice of bread and butter?'

How you enjoy it, too, when you have tired yourselves at play.

"Bread has been called '*the staff of life,*' and truly it deserves its name. Good wheaten bread approaches as nearly as possible to a *perfect food.* Its ample supplies of starch provide fuel-food; its gluten gives flesh-forming matter; it also contains salt and other mineral food, and even a small quantity of fat.

'New bread is not so digestible as stale, and should be eaten with caution. Bread, one or two days old, is best, as it digests much more easily than new bread. The so-called luxuries—muffins and crumpets and hot rolls—are most unwholesome food, and should be avoided.

"It is important to keep before us the fact, that the use of wheaten flour does not end with the loaf of bread. Think of the puddings and pies and cakes, which mother makes at home, and then think of the hundreds of tons of biscuits of all sorts, that are turned out week by week from our great biscuit factories.

"Good English-grown wheat has always taken a first place in the market, but our farmers could not produce anything like enough to fill the hungry mouths of our teeming population. The consequence is, we have to import immense quantities of the grain from foreign countries.

"It is estimated that we import upwards of sixty-five million hundredweights of wheat every year. The United States are our chief granary; but Russia, India, Canada, Australia, and South Africa, all contribute their share.

"In Scotland, wheaten flour gives place to oatmeal, which the Scotch people eat in the form of porridge and oat-cake. This is their bread, their *staff of life;* and we are told that they look with pity on the poor Southerner, who does not know the value of either cakes or porridge, and has only white wheaten bread to eat.

"We are here brought face to face, however, with the curious fact, that Nature provides special food to suit the needs of all her children. Wheat does not grow well in many parts of Scotland, but the oat is a hardy plant, and is able to stand the rigour of the climate.

"Then, too, if we examine the meal itself, we find that it contains not only more gluten, but ten times as much fat as wheaten flour; and fat, as you know, is a fuel-food. This makes oatmeal a much more suitable food for that cold bracing climate, than wheaten flour would be.

"It would not be at all suitable in the hot relaxing regions of the world, for the large amount of fat which it contains has in itself a relaxing effect on the system, although in the *cold bracing* air of Scotland this is not felt.

"*In the* East rice is *the* staff of life; and ugh this grain contains very little gluten in ›rtion to its starchy matter, it has a peculiar ng effect, which is the very thing wanted ɔse hot relaxing climates.

[t is not surely a mere accident, that this —rice—grows in lands, and under condi- where it would be impossible to grow either t or oats; for rice is said to feed fully one- of the entire human race, or more people all the other corn grains put together.

We ourselves use rice mostly in the form of ings, made with milk, eggs, and butter, ı supply what is wanting for our needs in rain itself.

Maize, or Indian corn, although it is used what largely in America, is valuable to us in the form of corn-flour for making blanc- es and puddings. In this form it consists ly of the starch of the grain; all the rest is ved in the work of preparation.

mary.—To English people bread is the *staff of life.* It is rich h and gluten, and it also contains mineral matters and some ı Scotland oatmeal becomes the staff of life; rice takes that ı in tropical lands.

OTHER VEGETABLE FOODS

You all know what this is," began Miss n, as she held the object before the girls at ɔening of the next lesson.

"Yes; it is a cob or ear of maize."

"Quite right," she replied. "We left off our last lesson with a word or two about maize; this morning I am going to commence with it.

"All the corn grains, or cereals, are used in the form of flour or fine meal. The Latin word for flour is *farina*. We sometimes, therefore, speak of these as *farinaceous foods*.

"Maize, like the rest, is ground into flour, but it contains very much less gluten than wheaten flour, and the consequence is we do not use it to any extent in England for making bread.

"Nearly all the maize, that finds its way to this country, comes in the form of corn-flour. Corn-flour consists entirely of the starchy part of the grain, and is used for making milk puddings and blanc-manges.

"To prepare this corn-flour, the grains are well soaked, till they swell up and become soft, and then they are crushed between rollers in a tank of water. As the crushing goes on, the water becomes white and milky-looking.

"*If you* think about our flour in the muslin *bag, you will* know what goes on in that tank.

“When the whole of the grain is crushed fine, milky-looking liquid in the tank is made to s through sieves, which hold back the pieces usk and skin. You remember, of course, that ll the grains, the gluten lies just beneath the i. When, therefore, these pieces of the skin held back in the sieve, all the gluten is held k at the same time.

‘The liquid which passes through, contains y the starch of the grain. It is made to flow tanks, and there left to stand for a time, all the starch has sunk to the bottom. clear water is then drained off, and the ch is removed and dried over a gentle t.

‘This starch is the corn-flour, which we use h milk and eggs to make our puddings and ac-manges.

“Next among the farinaceous foods come sago, wroot, and tapioca; they, too, are pure ches, and contain no gluten. These foods er from the others of the class in that they obtained, not from the grain, but from the stance of the stems of plants.

“Sago is obtained from the pith of the sago-m. The tree, when full-grown, is cut down, the soft, white, spongy pith is taken out of stem, and washed in water in a sieve. The l, which is mostly starch, settles at the bottom and is collected by draining off the water and drying in the sun.

"The tree is cultivated in most of the hot countries of the world, but its natural home is New Guinea, and certain parts of the coast of Africa. Here it forms the chief food of the natives, who bake the meal into a kind of bread. It is their *staff of life.*

SAGO PALM.

"Arrowroot, which we see in the form of a white glistening meal, is obtained from the underground stem of a plant grown in the East and West Indies. When the plants are a year old, they are taken up, and the underground stems, which are about the thickness of a man's finger, are broken and crushed up in water. The result of this treatment is to remove the starch, which sinks to the bottom of the water, and is collected and dried in the usual way.

"Arrowroot when mixed with milk makes a delicate, easily-digested food for the sick.

"Tapioca is prepared, in almost exactly the same way, from the root of a plant called the *manioc,* which grows in the tropical parts of Africa and America.

"The root is not unlike a turnip. The starchy al obtained from it has to undergo several shings, to remove the milky juice which it ntains, for that is a very deadly poison.

"After being washed, it is collected and dried hot plates, and during the drying process it is rred with iron rods. It is this which gives it lumpy appearance.

"Peas, beans, and lentils are included under common name of pulse, and form, as we have eady seen, a most important class of vegetable ds. We have already discussed their value h as flesh-formers and heat-givers.

"Pulse-meal, although highly nutritious, will t make light spongy bread; and in the countries ere it is most eaten it is made into cakes.

"The common French or kidney bean is stly eaten in the green state in this country. e useful haricot bean is simply the ripe seed of French bean. These and lentils are largely d in making soups.

"The broad or Windsor bean is only used as reen vegetable."

ummary.—Corn-flour is made from maize. It is a starch food, so are sago, arrowroot, and tapioca. Pulse-meal is largely used in lands; it forms a highly nutritious food.

GREEN VEGETABLES

A day or two later the girls, on entering the room, found the table laid out with a collection of vegetables of many different kinds. Mr. Jarvis, the green-grocer, had lent them for the occasion; and the table itself looked almost like a small green-grocer's shop.

"Now, girls," began Miss Brown, "although we call bread, in its many forms, the staff of life, I am going to show you to-day that there are many other plants, besides the corn grains, upon which we depend to a large extent for our daily *food; and* the green or fresh vegetables are not *the least im*portant of them.

"Among these green vegetables, it is the root of one, the stem of another, the leaves of another, and the seed-pods of another, that provide our food supply. The carrot, turnip, parsnip, and beet are useful roots; the onion is a bulbous stem; the potato a swollen part of the underground stem, which we call a tuber; the cabbage family provide leaves; celery is the leaf-stalk; and peas and beans are the seeds.

"We have only to think of the extensive market-gardens, which surround London, and, other great towns, and we shall be able to form a very good idea of the importance of these green vegetables, as articles of our daily food.

"Every one knows, too, that as the town increases, and spreads outwards, the surrounding land, which till then has always been corn-fields or grazing meadows, is at once turned into market gardens. People must have fresh vegetables every day, and the nearer the gardens are to the town, the easier and cheaper it is to convey the produce to market.

"But the home-grown supply of our own market-gardens, large as it is, would not be enough to meet the wants of our people. Thanks to steam navigation, we are now able to import fresh green vegetables, in good condition, from other countries. The Channel Islands, France, Belgium, and even distant Algeria, all help to supply us with these necessary articles c food.

"I think I have already told you that, thoug these green vegetables all contain starch, an some of them a fair share of gluten too, it is les on this account that we value them, than for th stores of mineral food which they contain.

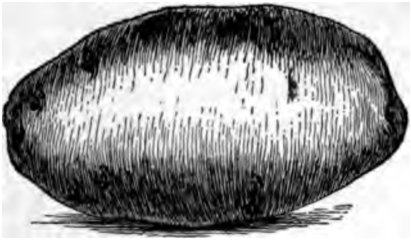
"This mineral matter is of the highest importance to the growth and well-being of the body It helps in the work of bone-making, and it act as a prevention against scurvy and other disease of the skin. People who, from any cause, ar unable to get fresh vegetables, are sure to suffe from such diseases sooner or later.

"Let us now take the vegetables one by one

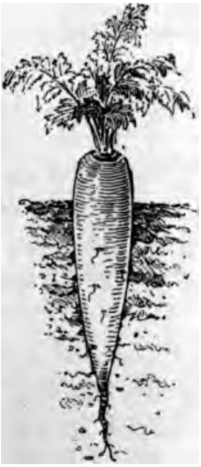
"Next to the corn grains the potato is th most valuable of all vegetable foods. It feed domestic animals as well as man, and is mor largely cultivated both here and in foreign lands than any other plant. To us a dinner woul scarcely seem a dinner without potatoes.

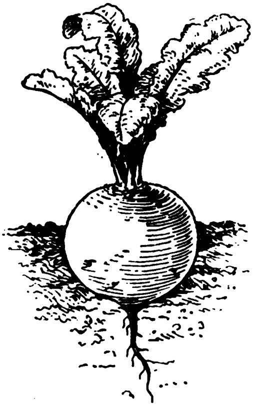
"The potato contains quite three-quarters c its weight of water, and nearly all its actual soli matter is starch. It would not make a good foo by itself. That is why we eat it with meat, fish or milk, for these things provide the flesh-formin matter which is wanting in the potato. Nev potatoes, although looked upon as a luxury, ar *not so easily* digested as the ripened tubers.

Instead of being mealy, they are close and waxy when boiled.



"Carrots, turnips, and parsnips are roots. They contain more water and less solid matter than the potato; but they are very nutritious,





especially the turnip and parsnip, because they contain, not only starch, but gluten and sugar as well.

"The farmer relies upon turnips to a large extent to feed his sheep in the winter; and the mangold-wurzel, with which he feeds his cattle, is only a large kind of turnip.

"Beet-root, as its name tells us, is the root of the beet. This too is a sort of turnip. Its flesh is of a deep-red colour; and the sugar, which it contains, makes it very sweet. It is boiled and eaten as a salad.

"The cabbage family, including the cauliflower, all contain a very large proportion of water; but their solid matter, when dried, is found to be rich in flesh-forming gluten, and this makes them a highly nutritious article of food.

"Onions are among the most valuable and nutritious of all these fresh vegetables. Considerably more than a quarter of the dry solid substance of the onion is gluten. Onions although sometimes eaten raw, are mostly used for seasoning purposes. As a rule, people object to their strong flavour, or they would be much more used than they are.

"The people of Spain make the onion a very important article of their every-day food. The large Spanish onion is much milder in flavour than our own.

"I want you to notice next that, with the *exception* of the onion, all the vegetables we have *mentioned* must be cooked before they are fit t eat. Here is one—celery—which we eat raw as well as cooked.

"Then, too, you know that we eat certain vegetables raw, in the form of a salad to make a cool refreshing dish in the summer. Among these are the lettuce, endive, water-cress, radish, mustard and cress, and cucumber.

"In addition to these, we use a number of herbs, such as parsley, mint, thyme, and others, for flavouring purposes, for soups and stews, and other made-up dishes."

Summary.—**Fresh vegetables, such as are obtained from the green-grocer, are valuable not only for their supplies of starch, gluten, and mineral matter, but because they act as a prevention against scurvy and other skin diseases.**

OUR ENGLISH FRUITS

"Look, girls," said Miss Brown, "I have changed my table to-day from a green-grocer's shop to a fruit-stall. You will find most of our well-known English fruits on the table. Let us have a talk about them.

"We regard fruit rather as a luxury than a necessary of life, and we eat it with pleasure, because of its delicious flavour. But I shall show you, as we go on, that the people in some parts of the world depend upon the fruits natural to the soil for their daily bread. The fruits in those lands *actually* become the *staff* of life.

"With us, however, it is different. Our fruits are valued, less for the amount of nutriment which they contain, than for the pleasure it gives us in eating them, and because they help to keep the blood in a pure healthy state. They contain mineral salts, in addition to the sugar, which gives them their sweet taste, and each individual kind of fruit has its own individual flavour.

"We eat fruit in its raw state as well as cooked; but the utmost care should be taken to see that no raw fruit is eaten unless it is quite ripe. Remember, over-ripe fruit is as unfit to eat as fruit that is not ripe; and most fruit is *more wholesome* cooked than raw.

"On the other hand some fruits, such as strawberries, grapes, and pine-apples, do not improve by cooking, but seem to lose much of their rich flavour.

"Let us now glance at some of our English fruits. Of course I can't put all our fruits on the table now, because, as you know, different fruits ripen, and come into season, at different parts of the year. This is a grand provision of Nature, for it ensures us plenty of fruit of some kind or other all through the year.

"Among our best-known English fruits are the apple, pear, cherry, plum, apricot, peach, gooseberry, currant, strawberry, raspberry, and blackberry.

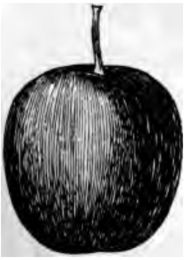
"The apple is to-day probably the most useful, and the most wholesome, of all our fruits. We eat it raw, and we also cook it in many ways, and it is a favourite with all. What a strange thing it is that this very useful English fruit, of which we have no less than two thousand varieties, is not a native of this country, but was originally brought from the East. The only apple known to the ancient Briton was the sour bitter crab, such as we still may see growing wild in our hedges. Most of our best apples of to-day were unknown in this country four hundred years ago. The apple orchards of Kent and Surrey were *nearly all* planted by order of Henry VIII., whose gardener brought young trees from the East for the purpose.

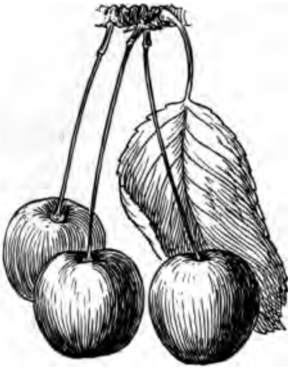
"A pleasant drink called cider is made from apples. This is the common drink of the country people in most of the western counties, especially

Devonshire, Somersetshire, Herefordshire, and Gloucestershire.

"The pear is also a very delicious fruit. It is very nearly related to the apple, and, like it came originally from abroad. Perry, another pleasant drink, is made from pears.

"The luscious cherry, although so common now, and such a favourite with everybody, was also a foreigner once. It was brought from the East, and planted in this country in the early Roman times, probably not later than 100 A.D. The extensive cultivation of the fruit, however, does not date back further than the time of Henry VIII. Cherries are eaten raw, and they are also used for puddings and pies.



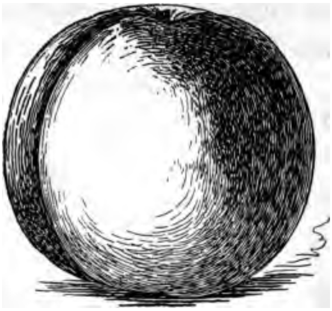


"Plums, like cherries, are stone-fruit. Their flesh is rich and juicy, and they too are eaten raw as well as cooked. There are many varieties of the plum. The damson is a small variety, so called because it was originally brought from Damascus. Its proper name is Damascene plum. The green-gage is a well-known, juicy, green plum.

"Stone-fruit of all kinds should be eaten with caution, and never except when quite ripe, for it is likely to cause diarrhœa.

"*Peaches* and apricots are also stone-fruits.

They are very delicious fruits, but they are so expensive that poor people cannot afford to buy them very often.



“The strawberry is one of the most luscious of fruits. It is such a general favourite, that it is cultivated in all parts of the country. It is *mostly eaten* raw, but immense quantities of the *fruit are* made into jam.

“The delicious raspberry is mostly eaten ked. Raspberry tarts and pies, and raspberry n are considered a great treat by most people.

“Currants and gooseberries are also eaten th cooked and in the raw state. There are ree varieties of currants—red, black, and white; ey grow in bunches on low bushes. The gooserry is a larger fruit than the currant, but, like at, it is full of a rich luscious pulp. It grows o on a low bush, but the gooseberry bush has ickly thorns.

Summary.—Unripe fruit should never be eaten raw; and over-ripe it is equally unfit for food. Stone-fruit should always be eaten with ution.

FOREIGN FRUITS

"Thanks to Mr. Thomson, the fruiterer, I have been able to get together another grand show of fruits to-day, girls," said Miss Brown. "Let us see what we have on the table.

"This great round fruit is a melon; the one just above it is a pine-apple, and in addition to them, we have oranges, lemons, grapes, bananas, prunes, figs, dates, raisins, currants, and I don't know what else.

"*I need* not tell you that these fruits are all foreigners. Steam navigation, however, has brought us into such close and rapid touch with the distant parts of the world, that our markets are now often glutted with these luscious foreign fruits, to an extent that would have been simply impossible fifty years ago.

"What would our grandmothers have thought could they have seen such dainties as slices of the juicy pine-apple, to say nothing of the delicious banana of the East and West Indies, sold in our streets at the cost almost of our own plums, apples, and pears!

"But our blessings as regards fruit in the present day do not end here. Shiploads even of our own most abundant sorts, such as apples, strawberries, and the like, reach our shores daily in the season, and so good wholesome fruit is brought within the reach of all:

"While speaking of foreign fruits let me say a word in particular about the banana and date.

"To the natives of Central America, the West Indies, and other tropical parts, the banana is more than a fruit, as we understand it. It contains, within its outer rind, a mealy substance, which, when dried in the oven, resembles bread both in taste and composition. It is the bread of the people there—it is their *staff of life.*

"The date, too, is the bread of the people of *Northern Africa.* It is, in fact, often called 'the *bread of the desert.'* The people of the oa dry and pound the fruit into a kind of cal and it feeds nineteen out of every twenty of population for most of the year.

"Such immense quantities of oranges brought here from Spain, Sicily, Malta, and West Indies; and so abundant and cheap is t delicious fruit on every street stall, that one scarcely look upon it as foreign produce.

"The fruit are packed green, as they gathered from the trees, and ripen and t yellow on their journey to this country. European fruit are known as a rule by th smooth, thin skin, and they come to us rol up singly in thin white paper. The West Ind variety have coarser and rougher skins, and th are not packed in separate papers.

"The lemon, sweet lime, shaddock, and cit come mostly from Madeira. The juice of lem is largely used as a flavouring for various arti of food and drink.

"Tons upon tons of grapes, packed in s dust, are sent to us from Spain, and some of other warm countries of Southern Europe. the countries where they grow, grapes mostly used in making wine, and as there many varieties of the fruit, so there are m *kinds* of wine made from them.

"*Grapes* are very delicious, wholesome

refreshing, and often form a most grateful addition to the sick-room, when no other fruit is allowed the patient.

"The rest of our collection — raisins, currants, figs, and prunes — are dried fruits.

"Raisins and currants are merely dried grapes. There are several varieties of raisins; they all come from the countries in the south of Europe. The finest are known as Muscatels; they are usually eaten with almonds, as a dessert in winter, when fresh fruit is scarce. The bunches are cut from the vine, and when dried packed in boxes, stalk and all. You will easily know them by their delicate purplish bloom. Valencias and Sultanas are other varieties of these fruits; the latter contain no seeds, and are chiefly used for making cakes. They are grown in Turkey,—hence their name.

"Currants, or Corinth grapes, as they are properly called, are a small seedless variety of grape, grown in the Ionian Islands and Greece. They are used with raisins for the Christmas pudding, and for making cakes.

"Figs, another dried fruit, are sent to us in large quantities, and are eaten just as they are. They are very delicate fruit, and, like raisins, contain a large amount of sugar.

"Prunes are simply dried plums. They are eaten raw, and are also stewed as a dessert."

Summary.—We import immense quantities of foreign fruits. Some, such as oranges, lemons, grapes, and bananas, come to us in their natural state; others, such as raisins, currants, figs, dates, and prunes are dried fruits.

PART II—CLOTHING

THE NATURAL HEAT OF THE BODY

"Food and clothing are our chief daily needs," said Miss Brown. "We have, for a long time, been studying food, and now we are going to turn our attention to clothing; but my first aim will be to try and show you how closely the two things are connected, one with the other.

"We have been taught to arrange the various food materials in different classes, according to the work which each has to do in the body.

"One kind, which we call flesh-forming food, is solely for the purpose of building up the body, and making good all waste.

"Another kind—and, remember, we want four *times as* much of this—is known as fuel-food, d is wanted for the purpose of keeping up the mperature of the body.

“Whatever the actual material of that food ay be—fat, starch, or sugar—it is altogether eless as building material; it is simply el; it is burned up in the body, and burning produces heat to warm the dy, and vital energy to enable it to ork.

“I have here a small glass instrument, hich is called a *thermometer.* You see it simply a tube, with a small bulb at one d. If you look at it, you will find that e bulb and part of the tube are filled ith something that looks like silver. his is mercury or quick-silver.

“You will see, too, some figures marked the tube. The top of the thin line of ercury stands at the figure 60.

“This little instrument can tell us exactly w hot anything is—it measures the heat—that the reason for its name *thermometer.* It is easuring the temperature of the air of this room st now. As the top of the mercury reaches to e figure 60, it tells us that the temperature of e air around us is 60 degrees.

“There is another thermometer on the table. ck it up and tell me how the mercury stands in *at one.*”

"It stands at 60 in that too," replied the girl who picked it up.

"Quite right; and now, girls, I want you to notice carefully what happens next. I have here a basin of hot water, and another of cold water from the tap; I will place one of the thermometers in each."

The girls watched, and in a few minutes were able to explain what had happened. The thin line of mercury in the one instrument had risen in the tube, because it had been placed in the warm water; that in the other had sunk lower down, because it was standing in the cold water.

"I think you will understand from this," resumed Miss Brown, "that the mercury rises in a warm temperature, and sinks in a cold one.

"Come here, Maggie. I am going to put the bulb of the thermometer into your mouth for a few minutes. When I take it out, we will look and see how far the mercury reaches up the tube. There is no need for me to say that it will not remain as it is at present, because you know the inside of your mouth is warm.

"I think it will do now," she said, after waiting a minute or two. "Suppose we take it out and look at it. You see the top of the mercury stands a little above the figure 98, and just there you see the words *Blood Heat.* That means to say that the temperature of your mouth, Maggie, is a little over 98 degrees; and I want you all to remember that the thermometer would mark exactly the same 98 degrees in your mouth or mine. You shall try it for yourselves presently.

"But this 98 degrees is not the temperature of the mouth only. You know we have blood coursing all through the body, and the temperature of that blood is also 98 degrees. That is what we mean by *Blood Heat.* The warm blood, coursing along, acts like the hot-water in the pipes of a large building, and warms the whole body.

"The fact is the natural heat of our bodies, which comes from the fuel-food burned in our internal fires, is always a little over 98 degrees, and this temperature must be kept, if we are to be well and healthy.

"When one falls ill, the temperature of the body changes; mother soon begins to get anxious, when baby is hot and feverish, and if there is not an improvement, she sends for the doctor.

"The first thing the doctor does is to find out the temperature of the body. The thermometer gives him the safest and surest way of learning this exactly. He puts the little instrument either in the mouth, as I did just now, or under the armpit, and leaves it there for a short time.

"If the mercury in the tube marks either more or less than 98 degrees, he knows that the *temperature of the* body is too high or too low.

and he sets to work to bring it back again t the natural state. If he can do that, the littl patient will be safe again, and out of danger.

"Picture to yourselves the same doctor, livin among the Esquimaux of the Frozen North. I he were to try the same thermometer in th mouth, or under the arm-pit of some health Esquimaux, he would find that the top of th mercury would still mark 98 degrees, or *Bloo Heat*, in spite of the piercing cold all round.

"Or let us picture him, if you like, in some scorching, tropical land. There, too, he would find the natural heat of the healthy body to be still about 98 degrees; and that temperature would vary only in sickness.

"The point I want you to remember is that *Blood Heat* is *Blood Heat* all over the world, and, measured by the thermometer, it is always about 98 degrees."

Summary.—The burning of the fuel-foods in our body produces heat. The natural heat of the body, measured by the thermometer, is about 98°. This is known as blood-heat.

HOW THE BODY LOSES ITS HEAT

"Suppose we begin with an experiment to-day, girls," said Miss Brown. "I have got an iron ball in the fire; I daresay it is red-hot by this time. I will take it out of the fire, and hang it by its chain from the gas-pipe. I want you all to come and stand round it in a circle. Of course, all of you can feel the glow of heat from the hot ball on your faces; and you can see already that the redness is gradually dying away from the ball.

"You may take your places now, and we will see what this means. The reason why you all felt the glow of heat from the ball is that direct lines, or rays of heat, were then passing from it, through the air, till they reached your faces. The same thing is going on now, and will go on till the ball has cooled down to the temperature of the air all round.

"The air, in fact, is robbing the heated ball of its heat. We say that the ball is losing its heat by *radiation*. If I had hung it up in the cold keen air outside, it would have parted with its heat much more rapidly than it is parting with it in this warm room. It would be quite cold out there in a very short time.

"Now I think," she continued, "we may leave the heated ball, and turn our attention t our own bodies. In our last lesson I showed yo that the natural heat of the body (blood-heat w called it) is a little over 98 degrees, as measured by the thermometer. The ordinary temperature of the air is about 60 degrees, although in the height of summer it is more than this, and in winter it is often as low as 20 degrees, and sometimes lower still. This surrounding air acts on our bodies just as the air acted on the hot ball—it robs them of heat.

"The colder the air is, the more rapidly does it rob the body of its heat by *radiation*. When you go out from this warm room into the cold frosty air, you feel the sensation of cold. This is simply because the cold air all round is greedily drawing away heat from every part of your body

"Remember, then, that our bodies are constantly giving up some of their heat by *radiation to the air* around us; and that the colder the *air is, the* greater the radiation of heat will be.

"I want one of you now to come to the front, and pick up this iron bar that lies on the table. That's right, Norah, you shall do it. Grasp it firmly in your hand, and tell us what you notice about it."

"It felt very cold at first," said Norah, after holding it for a short time, "but it seems to be getting warmer now."

"That's quite right," replied Miss Brown. "But where did the heat come from to warm the poker?"

"It must have come from my hand," said Norah.

"Of course it did," replied Miss Brown. "It was because the cold metal was robbing your hand of its heat that you felt the sensation of cold. When it had taken away enough heat to make itself as warm as your hand, you lost the feeling of cold.

"So then, you see we lose heat from our bodies not only by *radiation into the air*, but also every time we touch a thing, which, like the iron bar, is colder than ourselves. These things rob us of heat by conducting or carrying it away. We say the heat passes off by *conduction.*

"Children—girls as well as boys—are sometimes thoughtless enough to run about in the *morning without* their shoes. If you have ever stepped on the cold stones or the cold oil-cloth with your naked feet, you know what it is to lose heat by conduction. The reason why your feet became cold was that their heat had been carried off, or conducted away, by the cold floor on which you stood.

"Did you ever see a horse taking a short rest after tugging a heavy load up a hill? His body feels very hot if you touch it, and it is steaming all over; we say it *perspires.*

"We too, as you know, get hot and perspire with hard work like the horse, and the greater the exertion the more we perspire.

"This perspiration, which we can see in little round drops of water on the skin, passes away into the air in the form of vapour; and heat is the only thing that can change water into vapour. Where does the heat come from then, to change these drops of water into vapour? Of course, it must come from the body itself, and this shows us another way in which we lose some of our bodily heat.

"I think now we clearly understand that our bodies lose heat by *radiation into the air;* by *conduction,* when we touch things colder than ourselves; and again by *perspiring.*

"Just one thought more. You know that *we lose heat* more rapidly in the cold wintry *air than* in the warm weather. This explains why the inside fires must be kept going with plenty of fuel in the winter. Fat, which we seem to turn against in the summer, we eat with a relish in the winter, because we want it.

"Think how much heat the poor Esquimaux must lose in that biting cold air, and then I am sure you will not be too hard upon him, with his six or seven pounds of blubber-fat, and his delicious draught of train oil for a meal. He is only stoking up the fires.

"But what has all this to do with clothing? Wait, and you shall see, girls. The two things are more closely connected than you think."

Summary.—The body parts with its heat by *radiation* to the air all round us; by *conduction* when we touch anything colder than ourselves; and also by *perspiration.*

CONDUCTORS AND NON-CONDUCTORS

"Let us have another experiment now, girls," said Miss Brown. "I have two brass balls in the kettle, which is boiling on the fire. We will take them both out and hang them up, as I did the other ball. One of them I will wrap closely in this piece of fur before hanging it up; the other shall be hung up just as it is. I need not say, of course, that both are now exactly as hot as the boiling water itself.

"We will leave them for a time while we

have a chat. I was reading an account of a Russian winter the other day. In the middle of Russia the winter is so long, and the cold so intense, that the people not only build their houses with very thick walls, but they make all their walls double. The outer wall is like a winter greatcoat for the house.

"But these people do not expect that greatcoat to *make their house warm.* If you were to go inside, you would see an immense fire burning night and day in the middle of the great room. It is the fire that *makes the house warm;* the thick walls *keep it warm,* by not allowing the heat to escape.

"Whilst I was reading about these Russian houses, I thought they would help you better than anything else to understand the real use of your clothing. But before we go any further, let us have a look at the two brass balls, which we hung up just now. Go and bring me the one which has not been covered up, Norah."

Norah did so, and found that it was cool enough for her to handle.

"Now we will have the one which I wrapped in the fur, before I hung it up!" said Miss Brown. "That's right," she added, as Norah placed it on the table in its wrapper. "Remove *the covering,* and give it to me."

She loosened the fur wrapper easily enough but she very quickly dropped the ball when she picked it up, for it was as hot as it was at first. They all laughed—even Miss Brown joined in the fun for the moment, and then she said: "Never mind, Norah, this is exactly what I wanted all of you to see. If I had laid the hot ball on a cold stone, it would have lost its heat by conduction. The stone would have conducted the heat away. We say it is a *good conductor of heat.* Here, you see, we have kept the ball hot by wrapping it up in fur. The fur has actually prevented the heat from escaping. We say it is a *bad conductor*, or a *non-conductor* of heat.

"You put on your thick winter jacket and gloves when you go out, and you often call them your warm jacket, and your warm gloves, because you feel warm and comfortable in them. But I want you to clearly understand that they do not *make* you warm; it is your own internal fires which do that. Your clothes *keep* you warm, because, like the thick walls of that Russian house, and the fur covering round the hot ball, they will not let the heat pass away.

"I think I can prove to you very clearly that your clothes do not *make* you warm," she added. "I have a stone here, which I found in the garden this morning. It felt very cold as I picked it up, for it had been lying out in the frosty air, so *I wrapped it* in a piece of thick fur.

"Why," she said, when she had removed the wrapper, "it is as cold now, as it was when I first rolled it up in the fur, so the fur has not *made* the stone warm. The truth is the fur has kept it cold.

"The air of the room is warmer, of course, than the stone, and if there were nothing to prevent it, the stone would have been taking away heat from the air all this time to make itself warmer.

"The fur, however, is a *bad conductor*, and will not allow the heat to pass through, and so, curiously enough, the thick fur, which kept the ball hot, and keeps us warm, has kept the stone cold—and for the same reason.

"Now that I see you understand why the fur kept the ball hot," she continued, "I have something else to show you. In this basket I have some other brass balls, like those on the table. Just before the lesson began, I took them out of the kettle, and wrapped them up, hot as they were,—one in fur, another in a piece of wash-leather, another in woollen cloth, another in flannel, another in calico, and another, again, in linen. Here they all are; let us examine them.’

With the help of the girls, she turned them out of their wrappers, one by one, beginning with the fur; and gradually the whole story was told. *The ball in* the fur was still very hot. It had not *lost much of* its heat; neither had the one in the wash-leather. Those in the woollen cloth and flannel, although not so hot as the other two, had parted with very little of their heat—they were still hot. The next one, in the calico wrapper, was warm, but not hot. It had lost the greater part of its heat, and the one in the linen was all but cold; its heat was all gone.

"Now let us see what all this means," said Miss Brown. "Can any of you tell me?"

"I suppose the leather, the woollen cloth, and the flannel, like the fur, are *bad conductors*," said Norah, "and they do not let the heat pass away."

"Then, of course, the linen and the calico must be *good conductors*," added Nellie, "for both of them allowed the heat to go. And I should think the linen must be a better conductor even than the calico, because the ball in the linen was nearly cold when we took it out."

"You are both quite right," replied Miss Brown. "Fur, leather, and woollen materials of all kinds, are bad conductors, or as we sometimes call them, non-conductors. The best of them all for not letting the heat pass away is fur. Linen and calico are good conductors, linen being a better conductor than calico. We shall have more to say about this another time."

Summary.—Linen and calico are good conductors—they allow the heat to escape from our bodies. Fur, leather, woollen cloth, and flannel *are bad conductors*—they prevent the heat from passing away.

CLOTHING TO KEEP US WARM

"I want you to think for a moment about our experiment with the stone, which we wrapped up in fur," began Miss Brown.

"If you please, Miss," said Maggie, "I think I can tell you all about it. You wrapped the cold stone in fur, but when you took it out again it was as cold as it was at first. The fur could not make it warm. Fur is a bad conductor, and would not let any of the heat from the air of the room pass through to warm the stone."

"You are quite right as far as you go, dear," replied Miss Brown; "and I may add that none of the materials on the table—leather, wool, calico, or linen—would have been able to do any more than the fur did.

"And now let me give you all a surprise. have here some pieces of fur, wash-leather, cloth, flannel, calico, and linen, and there is a small thermometer wrapped up in each of them.

"Which of the instruments will show the highest temperature? Let us see."

She took them out of the wrappers, one by one, and the girls certainly were very much surprised to see that the mercury in all of them stood at the same level.

"What does this tell us, girls?" she asked.

"*It tells us* that the fur, leather, and woollen

aterials are no warmer than the linen and the
lico, I suppose," said Mary Jones, a very
oughtful and sensible girl. "But that seems
puzzle to me altogether, for the fur, the wash-
ather, and the wool, all feel warm now when I
uch them, and the other materials feel cold;
pecially the linen—that feels very cold."

"Well, girls," replied Miss Brown, "the ther-
ometer is like little George Washington—it
nnot tell a lie; it always tells the truth. You
ay be sure, if the fur had been warmer than
e linen, it would have told us so. But it is
t warmer. The fact is, none of these things
ve any warmth of their own—the fur, leather,
d wool are no warmer in themselves than the
lico and the linen. They had no warmth to
ve either to the stone or the thermometer."

"Then why do they feel warmer when we
uch them?" asked Mary, who could not under-
and it at all.

"I think I can tell why," said Norah. "I
member, when I picked up the bar of iron, the
her day, Miss Brown told me that it felt cold
cause it was a good conductor, and robbed my
nd of heat. Is that the reason why the linen
d calico feel cold?"

"There, girls, that's better than telling you
about it, isn't it?" said Miss Brown. "I
like you to find out for yourselves. Norah

has learned the whole secret. None of the things have any warmth of their own. Th reason why some feel warm is that they are no conductors, and do not take away heat from yo hand when you touch them. The others a conductors, and, like the bar of iron, begin once to rob the hand of its heat, and so make feel cold."

"May I ask a question, Miss Brown?" aske Mary Jones.

"Certainly, dear; what is it?" she replied.

"As fur is the best of all materials to keep warm," said Mary, "I think if I could afford I should clothe myself, from head to foot, in fu all the winter."

"So should I, so should I," cried one aft another, and they began to fancy themselv already wrapped up snugly in thick, soft, co fur clothing.

"Yes, but that is where I am puzzled," Ma went on. "The rich people, who could very we afford it, don't dress altogether in close-fitti furs. Will you please tell us why that is?"

"I am very glad to find that you are tryi to think these things out for yourselves," Mi Brown replied. "Let me make it clear.

"Fur is, as we have said, the best of all th non-conducting materials for keeping us war *It consists* not only of the thick, soft, smoot iry covering of the animal, but also of the skin, which the hair grows; and, in the work of eparing it for use, the skin is turned into ther. The hairy covering is in itself a non-nductor, and so is the skin. Fur, therefore, ords a double protection. So far, so good.

"But let us go a step further now. I have re a piece of fur, and some pieces of cloth, and nnel. I am going to lay them all in this plate, th a little water in the bottom of it."

After letting them remain a short time, she led upon one of the girls to come and take out e flannel, and tell what she observed.

"The flannel is quite wet all over," she said. can squeeze the water out of it."

"Quite right," replied Miss Brown. "What es that tell us?"

"It tells us that the flannel is porous, and at it absorbed the water, while it was in the ite," said Norah.

"Exactly," said Miss Brown. "You may take t the piece of cloth next, and you will find that be porous too. It has absorbed some of the ter, and you can squeeze it out, as you squeezed out of the flannel.

"Now I want you to look carefully at the ece of fur when I take it out of the water. The der side of the skin, you see, which has been *ng in the water*, is wet; but the upper side and the fur itself are quite dry. The water ha not gone through the skin—because that is no porous, like the flannel and the cloth.

“We have already had something to say about the work, which our skin has to do, in sweating or perspiring. You know that your body soon becomes damp all over with sweat or perspiration, when you exert yourselves, and this sweat is waste, poisonous matter, which the skin must throw off freely, if we are to remain in good health.

“Indeed, it is impossible for any one to be healthy, if the skin is not allowed to do its work properly. But this is not all. The perspiration must not only be given off from the skin, but it must also be allowed to escape.

“Now woollen clothes and furs are both non-conductors, and keep the body warm, by not allowing the heat to escape. The skin of the fur, however, being water-proof and air-proof leather, shuts in the perspiration too, which porous woollen clothes absorb, and carry off.

“Hence, you see, woollen clothes are more healthy to wear, than the very best fur dress could be. They keep the body warm; but, a the same time, they allow the perspiration to escape, because they are porous.”

Summary.—Fur, wool, flannel, and leather are no warmer in themselves *than* linen and calico. They keep us warm simply becaus *being bad* conductors, they prevent our bodily heat from escaping.

CLOTHING AND CLIMATE

"We left off the other day by comparing furs and woollen materials as clothing," said Miss Brown, "and we came to the conclusion that it is healthier to wear woollen clothing than the best of furs. Can you tell me why, girls?"

"All the materials made of wool are porous, but fur is water-proof and air-proof," replied Norah. "The porous woollen materials soak up the perspiration, and let it pass away, but the leather skin of the fur keeps the perspiration in, and will not let it escape."

"You are quite right, Norah, and that is why fur would be a very unhealthy kind of clothing to wear for any length of time. Your answer, too, will make a very good stepping-stone to the next part of our subject, for I want to talk about the most important of all our clothing, now,—the garment we wear next to the skin.

"We may have warm frocks, warm cloaks, gloves, muffs, and victorines, but if this one under-garment is not made of the right material, our other clothing will afford us very little protection against taking cold.

"Let me explain what I mean. Picture yourselves after school is over, and play-time comes. You run, skip, and romp about, till you get heated, and your body begins to perspire.

Remember, it is the garment next to the skin, which absorbs the perspiration first. In fact, if you perspire very much, that garment will get quite wet with the perspiration.

"Here are three saucers, filled with water at about the temperature of our own bodies. You see the thermometer in each tells us that. I will put this piece of flannel in one, and pieces of calico and linen in the others, so that they may get soaked with the water. Now take them out and wring them, and then place your hands upon all three, and tell me what you observe."

This was done, and the girls were soon able to tell that, while the flannel kept warm, the others quickly became cold and clammy. All were porous, and had absorbed the warm water, but the flannel had not parted with the warmth, because it was a bad conductor. The others being good conductors allowed the warmth to escape.

"The very best piece of advice I can give you, girls," continued Miss Brown, "is that you should always wear flannel or some woollen material next to the skin; and I think our little experiment has shown you the reason why.

"Not only is this sound advice for you, but also for every one,—man, woman, and child. *Your* brothers work hard perhaps, in the cricket *and foot*ball field; father and mother work hard their daily occupations; they all get heated, ıd perspire.

"If the garment they wear next to the skin made of some sort of porous, non-conducting ıaterial, it will not strike cold and clammy, as a ılico or linen garment would—there will be very ttle risk of catching a chill.

"Remember, that a garment of this kind is far etter than a cloak or a greatcoat without it. The loak or the coat may be laid aside, or forgotten, t the very time when it is most needed; but this rotecting under-garment is there at all times.

"Some people are ready enough to wear flannel ext to the skin in the winter, but they forget that is quite as necessary in the summer, in a hangeable and uncertain climate such as ours. ndeed, we are much more likely to get over-eated, and perspire freely, in the summer than ı the winter; and then if we do not wear the ight sort of garment next to the skin, there is reat danger afterwards in standing about.

"Of course the skin garment for the summer hould be thinner, and more open in texture, than hat for the winter. All that is necessary is that should be made of some non-conducting ıaterial, and of these wool is by far the best."

Summary.—**Flannel is a good material to wear next to the skin, ecause it is porous and absorbs the perspiration, while at the same me it does *not part with* its heat, and so give us a chill, because it is *bad conductor*.**

DARK AND LIGHT-COLOURED CLOTHING

"Our last talk was about the proper sort of garment to be worn next the skin," said Miss Brown. "Suppose we to-day turn our attention to our cloaks, jackets, capes, and the rest of our outer clothing.

"But before we do that, I want to talk to you about a simple little experiment. I cannot do the experiment for you here. You will see why in a moment; but you will be able to do it for yourselves another time.

"In the winter, we often see the sun shining brightly, although the snow is lying on the ground. Next time you do so, you may perform this little experiment for yourselves. It will be sure to happen just as I tell you now.

"You will only have to place two pieces of cloth—one a dark colour, and the other a light—on the snow, side by side, and watch them. In a little while you will find the snow under the dark-coloured cloth all melted, although that, under the other piece, remains unchanged.

"'Why should this be?' you say; and now I have a surprise for you. It is not because there is any difference in the material, for they are both cloth. It is not because one is warmer *than* the other, for these materials have no *warmth* of their own. It is all due to the colour of the cloth. Dark-coloured materials always absorb the rays of heat from the sun; but light-coloured ones reflect the heat, or throw it back into the air again.

"I will try and make you understand what I mean by saying that the heat is reflected. You see the sun is streaming in through the window. If I hold this sheet of glass in the rays of light they will pass through, and you will see the shape of the glass on the floor. Now, instead of the sheet of plain glass, I will hold this piece of looking-glass in the light. The light does not pass through the looking-glass, you see. It is thrown back from the surface of the glass, and you can see it playing about on the ceiling.

"I have often seen children amuse themselves in this way with a Jack-o'-Lantern, as they call it. The rays of light are reflected, or thrown back, y the surface of the glass, and this is exactly hat happens to the rays of heat, when they fall n the piece of light-coloured cloth.

"Now I think you will readily understand at the colour, as well as the nature of the aterial, must always be taken into account when e are choosing our clothing.

"In the winter our outer garments must not ly be made of non-conducting material, but at material should be of some dark colour, cause dark-coloured materials are good ab-

sorbers of heat, and they will absorb what h there is around, although they take good c not to let any of our bodily heat escape.

"A person is alw warmer in a black dr than she would be in white one.

"When winter is ov we begin to lay aside dark-coloured clothi and dress ourselves lighter, brighter colou but this is not merely make ourselves look n —it is more comfortab What is nicer in the h summer weather than white dress? The whi colour reflects the sun's rays instead of absorbi them, and so helps to keep us cool."

"If you please, Miss," said Norah, "I ha often noticed gentlemen, in the hot summ weather, with a white scarf tied round their h Do they wear the scarf for the same reason?"

"Yes, Norah, you are quite right," repli Miss Brown. "The white scarf reflects the su rays. When our soldiers go into hot countri they always wear white helmets, as well as sca to protect them from sunstroke.

"Indeed, the people in the tropical regions of the world very rarely wear anything but white garments. Their main object is not to keep warm, but to keep cool. They wear garments made of some good conducting material, to allow as much as possible of their own bodily heat to pass away; but they wear white clothing because that will reflect or throw back the scorching rays of the sun, and so protect them from heat."

Summary.—Light-coloured clothes reflect or throw back the sun's rays. They are well suited for summer wear, and for hot climates. *Dark-coloured materials* absorb the heat rays. They would make us hot.

Clothing for Personal Adornment

"Before proceeding any further with our study of clothing, let us pause for a while, and consider what we have already learned, as to its uses," said Miss Brown. "I want you to tell me all you can remember. Suppose you begin, Maggie."

"We wear some clothing to keep us warm," replied Maggie, "and this must be made of non-conducting material; but we also wear other clothing to keep us cool, and this is made of some material, which is a good conductor, and will allow our bodily heat to pass away."

"But, besides being a good conductor, it must also be white, or some other light colour," added Norah, who had not forgotten the surprise of the last lesson, "for light-coloured materials keep out the heat of the sun. They reflect, or throw back the rays of heat, but dark-coloured materials absorb them."

"I suppose it would be quite right to say that we wear some clothes to keep us dry," said Mary Jones, "for our boots and shoes keep our feet dry; and I have often heard mother say how important it is not to get wet feet."

"That is a very thoughtful remark, Mary," said Miss Brown, "and it does you credit, because I have not yet mentioned this fact, and

shows that you are trying to think these things
t for yourself.

“Yes,” she added, “the leather, of which our
ots and shoes are made, is not only able to
ep our feet warm, be-
use it is a bad con-
ctor, but it keeps them
y, because it is water-
oof, and will not allow
e wet to get in.

“Then, too, think
at a protection to our
der feet, a stout pair
boots or shoes must
Think what it would
to walk over the
gh, stony roads with-
shoes.

“Now, so far we have
sidered only the use-
ess of clothing, to protect us, in one way or
ther, from the climate in which we live.
t in many parts of the world, there are no
gers of either heat or cold to fear, and the
ive savages need no protection. They clothe,
rather dress themselves, not for protection
inst the climate, but merely for personal
rnment. A girdle of plaited grass or reeds,
h a plentiful show of coloured beads, shells, or

feathers, and a ring or two hanging from the nostrils and ears, is the height of fashion for them. Others endeavour to add to their personal appearance by wearing a profusion of rings

LADY AND CHILD OF THE PRESENT DAY.

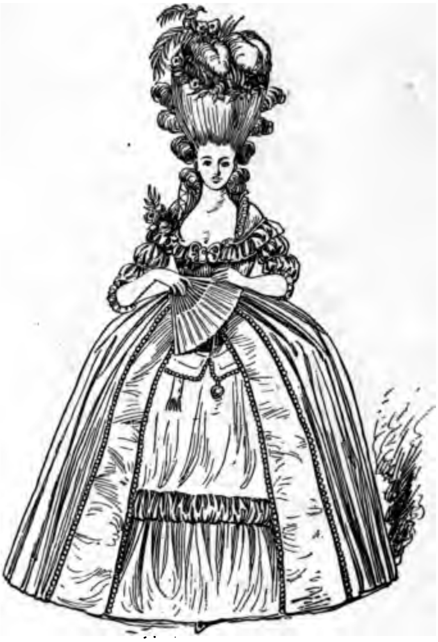
round the wrists and ankles. These things suit the savage mind.

"I am always deeply grieved to see, as one does sometimes, foolish girls and women bedizen themselves out with gaudy finery, in the shape of showy ribbons and feathers, when the money *which* is spent on them, would purchase that *good useful* underclothing, of which they most likely stand in great need. It almost makes one think that the savage element is not yet altogether driven out from some of our own people.

"You must not mistake me, now, in what I am saying. It is the duty of every one (and of the woman perhaps more than the man) to study personal appearance. It should be every girl's pride and pleasure to keep herself neat, tidy, and lady-like. But this is a totally different thing to dressing oneself up in tawdry, showy finery.

LADY AND CHILD, 1837.

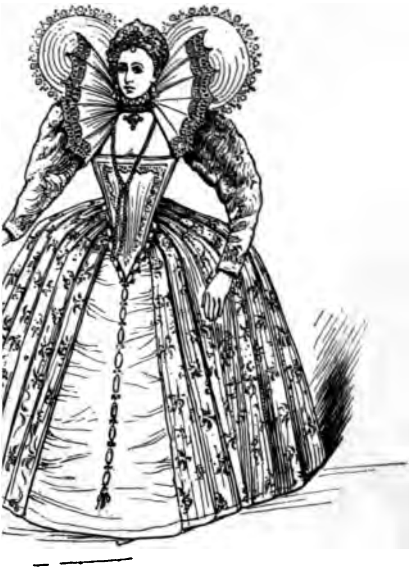
"I think, perhaps, there never was a time when the style of dress for women and children, was so becoming, and when there was such a variety of clothing materials, in every shade of colour, as the present. All that is wanted is a little natural taste in choosing one's dress.



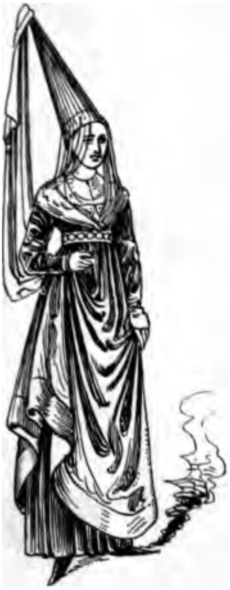
LADY—MIDDLE OF THE EIGHTEENTH CENTURY.

"Let me show you a few pictures which I think will interest you. The first is a neatly-dressed lady of the present day, out walking with her little girl. Compare this picture with the next. *This one* represents a lady and child, as they ght have been seen in the year 1837, when r good Queen came to the throne. What an vance we have made since then!

“Next comes another lady in the costume of ut one hundred years before Queen Victoria s born; and then another in the dress worn the ladies of Queen Elizabeth's time.



LADY—REIGN OF QUEEN ELIZABETH.

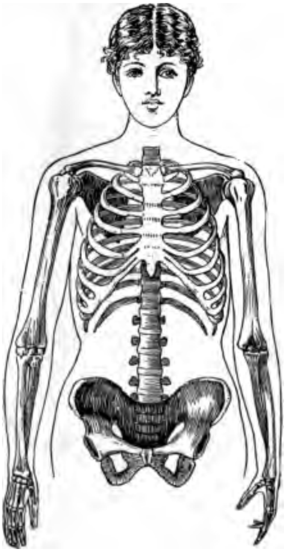


LADY OF THE FOURTEENTH CENTURY.

“This one, with the tall head-gear, like a huge ar-loaf, represents a lady of the fourteenth *tury.*

***Summary.*—Next to their utility in protecting us against the weather, our clothes serve as personal adornment. It should be every girl's pride and pleasure to keep herself neat, tidy, and lady-like, and to avoid tawdry, showy finery.**

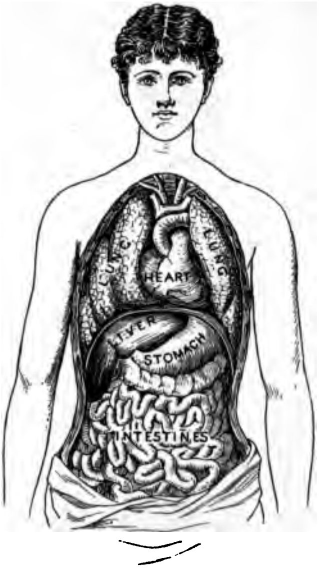
SOME USEFUL HINTS ABOUT CLOTHING



"I have some curious and interesting pictures to show you to-day, girls," began Miss Brown. "They are sure to be interesting, because they are all about ourselves. Look at this one, to begin with. It represents parts of the skeleton of our own body.

"That strong-looking pillar in the middle is the spine or back-bone. You can feel it down the middle of your own back. But I want now to call your attention specially to those long curved bones, which stretch round from the spine to the front of the body, reminding one somewhat of the hoops round a cask. They are the ribs; there are twenty-four of them altogether, twelve on each side, and they form the upper part of the body into a sort of strong bony cage.

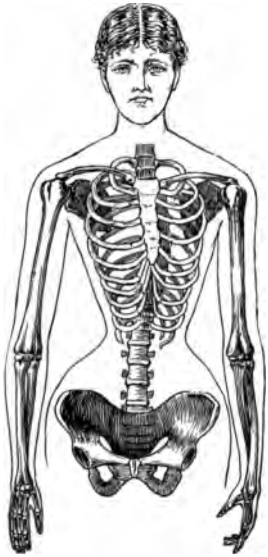
"Now, I think you will easily see that as his part of the body is specially protected by ibs of bone, there must be something very mportant inside, which equires to be taken more care of than some f the other parts. Let s see what there is nside.

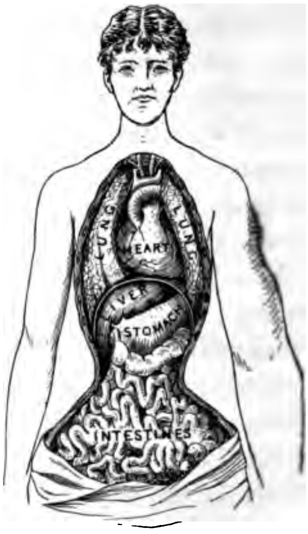


"This picture shows ou that inside the ony cage are situated he heart, for pumping lood through the body, nd the lungs, for reathing—one on each ide of the heart. These ery important parts of he body take up the hole of the cage or *hest* as it is called; and below the chest you an see some other parts, also very important, he stomach, the liver, and the intestines, hich have to do the work of digesting the ood.

"Now, let me show you another picture. Notice what a different shape the bony cage s in this one. The first picture shows the *age as it should* be; this one shows it, in a distorted or deformed shape, as some foolish girls and women make it by tight-lacing.

"Of course if the chest itself is pressed in, and distorted in this way, it stands to reason that those delicate vital organs inside must be





pressed and distorted too. Look at this picture; it will show you how they are all forced out of their proper shape, and out of their proper position by this foolish and vicious practice.

"Think of that wonderful piece of machinery,—the heart. It began its pumping work with *the first* dawn of life; it can never stop for *a moment* to take rest till death comes. The instant it stops, it is all over with us. Surely that fact in itself should be enough to show us of what immense importance it must be. When it is cramped, distorted, and thrown out of its right position, its work is interfered with, and the blood cannot circulate freely through the body.

"Think, too, of those delicate organs of breathing,—the lungs. Night and day, sleeping and waking, their work must go on. You have only to place your hands on your own chest, and you will feel the whole of the bony cage of ribs rise and fall at each breath you take. But if those ribs are pressed in and held fast by tight-lacing, so that they cannot move, the lungs themselves are prevented from working, and they gradually begin not only to get distorted in shape, but also to dwindle in size, and grow weaker and weaker, till at last active disease sets in.

"Thousands of poor deluded girls have been their own destroyers through this pernicious practice,—consumption, a life of torture, and an early death have been the only reward they have reaped.

"But it is impossible to single out individual organs, because not only heart and lungs, but liver, stomach, and all of them suffer, *and act and re-act on* each other.

"Girls," she continued, and the very tones of her voice told how deeply she felt all she said, "I implore you, as you wish to grow up healthy, happy women, never to be guilty of this ridiculous and dangerous practice.

"As a matter of fact, stays and corsets are not necessary articles of clothing at all. But if you do wear them, remember they must never be laced after you put them on, and they should never require to be unlaced before they can be taken off.

"The other day we saw some pictures, showing the changing fashions of clothing for women and girls. But whether it be the fashion or no to appear to have a small waist, remember that it is unnatural, that it will ruin your health—and shun it, in spite of fashion."

"I can't see how any one can think it elegant, to be screwed in round the waist like a sort of sand-glass," said Norah. "Girls like that always remind me of a wasp or a spider. I am sure I will never lace myself in." "Nor I," "Nor I," "Nor I," broke in all the rest of the girls in chorus!

"I might add in conclusion, girls," said Miss Brown, "that all articles of clothing are faulty, and should at once be discarded, which tend *to impede* the free movements of the body or *any part* of it. Avoid tight sleeves—they interfere with the circulation of the blood, and also with the proper action of the muscles of the arms and chest.

"Avoid tight skirts—they impede the free movement of the limbs in walking, and rob a girl of one of her chief attractions, her natural and graceful carriage.

"Avoid heavy clothing for the same reason, and remember that, as far as possible, all garments should be made to throw the weight on the shoulders, rather than on the waist."

Summary.—Tight-lacing is the ruin of hundreds of girls. Avoid it; and avoid tight clothing of every sort. No garment should be worn to impede the free movements of any part of the body.

More Useful Hints

When the time for the next meeting came, the girls might have been seen in little knots of five or six, eagerly discussing the subject of tight-lacing. They had clearly been talking the matter over with their mothers at home, and several of them were able to point to cases, which had come under their own notice, of girls who had suffered from the silly practice.

"Now, girls," said Miss Brown, when she arrived, "I have some more valuable hints for you to-day. I want to give you some advice dealing with feet, head, and hands. Let us commence with the feet.

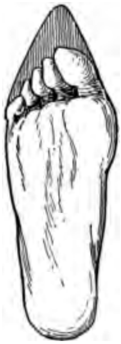
"We have already noticed the special fitness of leather as a covering for the feet. It is not porous; in other words it is impervious to wet, and so keeps our feet dry. It is also a bad conductor of heat; it will not allow our bodily heat to escape to the cold damp earth, and so it keeps the feet warm."

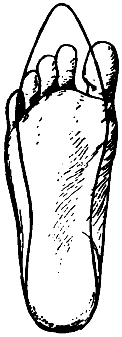
"I know mother is always very careful to see that I don't get wet feet," said Norah. "She is more particular about the feet than any part of the body. She says more deaths can be traced to carelessness in getting wet feet than to any other cause. She tells me never to sit about in my damp boots after I have been out in the rain, but to keep on the move till I am able to change them."

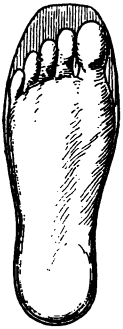
"Very excellent advice too, Norah," replied Miss Brown; "and now let us think about the boots themselves. Never wear tight boots. They interfere with the circulation by pressing upon the blood-vessels, and so cause cold feet and chilblains. Tight boots, too, press the toes together, and not only produce corns and bunions, but change a girl's easy, graceful movements into an awkward, ungainly hobble; and yet some girls will suffer all this, just to appear to have a small foot. What folly it is!

"*The boot should fit comfortably, and allow room enough* for the toes to spread, in their natural way, as we walk. You will easily see what I mean if you stand, without your boots, on a sheet of paper, and let some one draw the outline of your feet on it. The shape marked out on the paper will show how absurd it is to cram the feet into the little, narrow, fashionable boots one sees in the shop windows.

"Remember, it is much better in every way



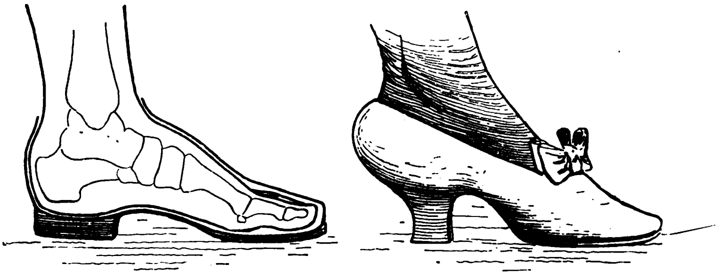




to have the boots a little too large, than a little too small. They should have broad soles, broad toes, and broad heels; and this brings me to notice another ridiculous error, in the so-called fashionable boots. I mean the high heels.

"The weight of the body should, of course, rest on the flat sole of the foot; but these ridiculous heels throw the weight forward, so that it all rests on the toes, and the natural balance *of the body* is disturbed. The toes too are forced against the upper leather of the boot at every step, and corns quickly form on them, to further add to the awkwardness and discomfort. Girls and women, who wear high-heeled boots, are never able to walk any distance; neither can they move about quickly or gracefully.

"Going back once more to the main object of covering up the feet, let me remind you that good boots can only do part of the work of keeping our feet warm; we must also have good stockings. These should always be made of some woollen material. The water-tight and air-tight leather of the boots keeps in all the perspiration, and so has a tendency to chill the feet. If the feet then are well covered with porous, non-conducting, woollen stockings, the perspiration is soaked up, without robbing them of their heat and so causing a chill.



"*Avoid* tight garters; they press upon the *blood-vessels* of the leg, and are almost always the cause of varicose, or swollen veins, which will be a source of great trouble in after life. At the same time I must warn you that nothing gives a girl a more slatternly appearance than to have her stockings hanging loosely about her legs. If she wears garters, they should be worn above, and not below the knee; but suspenders are, for many reasons, better than garters.

"Next, as regards the head, I may as well commence by saying that it is as necessary to keep the head cool, as it is to keep the feet warm. Whatever covering, therefore, is worn for the head, it should be of an open texture, or at least well ventilated. The head, of course, perspires, like the rest of the body, and there must be a means for the escape of the perspiration.

"Beyond that I have not much to say except to remind you of the kinds of material mostly used as a covering for the head. Straw-plait is used, undoubtedly, more than anything else for this purpose. It is suitable for all seasons. A light-coloured straw hat reflects or throws back the sun's rays in the hot summer, besides forming, in itself, a protecting shade for the head.

"Even in winter, a straw hat is warmer than many people suppose, for the straw is a bad conductor, and does not allow the heat to pass away *very rapidly.* On the same principle a strawthatched house is warmer in winter and cooler in summer than any other.

"Felt is largely used in winter for ladies' hats, but the hats must be well ventilated, for the felt itself is of a very close texture. The soft felt hats are the best; hard, close-fitting hats often give rise to headache, and if much worn, will cause the hair to fall out.

"Let me remind you that whatever kind of head-dress a girl or a woman wears, it should be neat and pretty without being gaudy.

"Gloves are an important article of out-door dress—in the winter, to keep the hands warm, and at all times to keep them clean. Like boots, they should never be tight, to interfere with the circulation, or cold hands and chilblains will be the result.

"Gloves, like stockings, are woven from silk, cotton, and woollen thread, woollen gloves being specially warm and comfortable for the cold weather. Kid gloves, too, are largely worn, but they are not all made from the skin of the young goat. Sheep, lamb, deer and even dog-skins are used for the cheaper sorts of 'kid' gloves."

Summary.—Keep the feet dry. Never sit about in damp boots. Never wear tight boots. Corns and bunions will never come with broad soles, broad toes, and broad flat heels.

PART III.—WASHING

PREPARING FOR THE WASH

“We finished our course of lessons on food and clothing to-day, mother,” said Norah, “and next week we are all going to Mrs. Grant’s laundry, for the first time. Miss Brown has arranged it all, and Mrs. Grant is going to teach us laundry-work.

“Each girl is to have a tub to herself, and rons for ironing, and I don’t know what else. Won’t it be fun? I shall look just like Martha, when I am up to my elbows in soap-suds. But am going to try my best to learn how to do it ll. I will come and tell you how I get on every day, mother. Shall I?”

“Yes, dear, I shall be very pleased to hear all about it,” replied her mother; “and I shall be more delighted still when I see you able to do all these things in an orderly way for yourself.”

“Miss Brown had a long talk with us this afternoon about the beauty of cleanliness,” continued Norah. “She says cleanliness is as necessary to our health, as good food and suitable clothing. If we wish to be healthy and happy, we must be clean in our clothing, clean in ourselves, and clean in our homes.”

“*Quite right*, dear,” replied her mother, “and

I hope you will store up in your mind the wise advice of your good teacher. You know I have always striven to make home a clean, bright, cheerful place. Your dear father looks upon his home as the best place on earth—a little haven of rest, after his day's work. He is never quite happy away from it. Some poor men never seem to get much happiness at all in their homes, and their spare time, and spare money, too, are usually spent in the ale-house. But such homes are, as a rule, dirty, thriftless and comfortless, and oftentimes it is not all the man's fault."

"I am sure I shall try to profit by our lessons," said Norah, "for clean people must be more comfortable than dirty people, to say the least about it. By and by we are to have lessons on personal cleanliness, and practical lessons on house cleaning; but at present we are to think only of washing."

"As to-morrow is our own washing-day, dear," replied her mother, "we will get ready for it now. You know how to sort the clothes; so you shall do that part of it all yourself."

The busy little woman at once set to work to sort out the things from the dirty-clothes basket, while her mother sat by and watched her.

She began with the fine things, such as father's *white* shirts, the linen cuffs and collars, and *mother's* lace collars and tuckers. These made her first heap. Next to them, in another heap, she placed the table-cloths and table-napkins. Then came another heap of underclothing, bed-inen, night-dresses, and bed-room towels. After hese she made quite a heap of handkerchiefs; nd then another of coloured things, such as rint frocks, aprons, and pinafores. Then came he flannels, the socks and stockings, and last f all the kitchen towels, dusters, and coarse prons.

Her mother watched, as all this went on, nd then at last she said, "Capital, dear; but ou have forgotten something."

"Oh yes, mother," she replied. "I ought to ave put aside the garments that are torn. hey must be mended before they go into the ater, or they might get torn more with the ubbing. But I think the only torn thing is Bobby's blouse. Here it is. Of course we shall mend the socks and stockings after they are washed."

"That's right," said her mother. "Now give me the blouse, and I will sit down and mend it, while you finish your writing exercise."

Norah settled down to her writing, and everything was going well, till, all of a sudden, she gave a frightened little scream, which caused her mother to look up from her needlework. Poor girl! *she had* upset the ink-stand into her lap, by accident, and she began to cry because *she* thought her pretty pinafore was spoiled.

"Never mind, dear," said her mother. "*I* suppose it was an accident. Let us take *the* pinafore off. We'll soon make it all right. Don't cry. Now run and fetch me the milk jug."

Norah did so, and then watched her mother pour some of the milk into a dish, and soak the ink-stained part of the pinafore in it.

"*We will* leave it now for a time in the milk, orah," said her mother, "while I set to work soak in the things in readiness for to-morrow's ash. I have finished mending Bobby's blouse.

"You see," she added, as she went on with er work, "this steeping or soaking the clothes ie night before in tepid water saves a great deal labour on the actual washing-day, for it helps loosen the dirt, and makes the things easy to ash. These things are very dirty; that is why am soaping them well, one by one, before I ess them down in the water.

"There is a jug of strong soda water on the ble, dear. I dissolved the soda by pouring boil-g water on it, while you were sorting the clothes. is cool enough for use now; so we will put me of it into the tub with these dirty clothes. will help to loosen the dirt.

"We must not put any of it into the tub here the fine white things are, for soda has a sty habit of turning things yellow. See, I will t some powdered borax in with them instead soda. That will loosen the dirt, without turn-g the clothes yellow.

"Last of all I will put the handkerchiefs in ak by themselves, and throw a handful of salt to the water with them. It will make them sier to wash to-morrow. There, that will do," e said, and started to come away.

"*But you* have not soaked in the flannels and the coloured things yet, mother," said Norah, as she saw her mother preparing to dry her hands.

"No, dear," replied her mother, "we do not soak flannels, because that would make them shrink; nor do we soak coloured things, because the soaking would take the colour out. And now," she added, "let us have another look at your pinafore. I think the ink-stains must be nearly gone by this time, but I will make sure of it."

So saying, she powdered a little starch and rubbed it all over the parts, that had been stained with ink.

"There," she said, "when Martha has washed the pinafore to-morrow, you will not find a sign of an ink-stain left."

Summary.—Soda turns the clothes yellow. It should be used sparingly, and only as a solution. Powdered borax is best for white things.

LEARNING TO WASH

"Oh, mother, I wish you could see our laundry, and all the girls at work in it," said Norah, on her return home after her first day's experience. "Each girl had to wash a garment of some sort, all by herself; and I can tell you it did look comical, to see us all in our big coarse *aprons,* with our sleeves turned up, standing at *the tubs,* and rubbing away at the clothes.

"When we first got inside, we found the pper fire already lighted, and our tubs all in a w waiting for us. While we were putting on ır aprons, Mrs. Grant began to take the garments ıt of the water, in which they had been soaking l night, and put them, one by one, into our tubs. ıen she poured into each tub, some of the water t of the copper. This, of course, became cooler soon as it touched the cold, wet, calico garments, d when we could comfortably bear our hands in she set us to work. But we had to do exactly she told us.

"There she stood in front of us all, and gave r orders, something like this: 'Remember, ls, you are to rub the clothes, and not your nds. If you rub the clothes with your hands, tead of rubbing one part against another, you ll not only rub them into holes, but you will the skin of your hands off as well.

"'You will begin by soaping the clothes on the tside, and rubbing them well, till all the dirt removed. This we call *Firsting.*'

"While she was instructing us in this way, was busy filling up the copper again, and ing round from one girl to another, to see that were doing the work properly.

"After the clothes had been well rubbed on outside, she told us to turn them *inside out,* *d wring them.* Then we emptied our dirty

water away, put fresh hot water into our t
from the copper, and began to soap and rub

things on the wrong side, as we had already d
on the outside. Mrs. Grant calls this *Second*

"The next step is to boil the clothes:
before she put them into the copper, Mrs. G
took out some of the hot water to fill up the t

and replaced it with cold. She says it would only help to fix the dirt in the things, if they were put into boiling water at first.

"So the clothes were put into the copper of warm water, and while we pressed them down with the copper-stick, Mrs. Grant cut up some soap into small pieces, and put it in with them. Then she left them to boil up gradually, and when they came to the boil, some one had to press them down from time to time with the copper-stick, so as to keep them under the water.

"This boiling helps to keep the clothes a good colour, provided they are not boiled too long, for that would make them yellow. Mrs. Grant always boils her clothes for about a quarter of an hour or twenty minutes.

"Well, when they had boiled long enough, the next business was to take them out of the copper. Each article was lifted out with the copper-stick, and left to drain; and when most of the water had drained out of them, they were all put into a tub of clear cold water, and Mrs. Grant set me to stir them about with a stick. The object of this is to get rid of as much of the soap as possible. She calls it the *First Rinsing.*

"But, oh mother, the most comical part of all was to see us girls, two and two, wringing the things out of this rinsing water. However, we got all the wringing over, with many a hearty laugh, for we thought it great fun, and then the things had to be shaken out, and rinsed

once more. This time the rinsing water was made blue, by squeezing the blue bag in it. The blue water makes the clothes a good colour; *without it they* would soon turn yellow, from the and replaced it with cold. She says it would only help to fix the dirt in the things, if they were put into boiling water at first.

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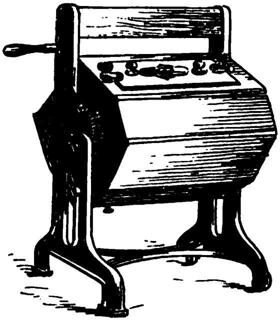
"Soda dissolves easily, for it is very thirsty for water. It will even absorb the moisture from the air, if it can. This is why Mrs. Grant keeps her soda covered up in those jars, and stored away in that dry room. She showed us some soda, which looked just like a white powder. This had been left exposed to the air, and the moisture from the air had spoilt it.

"She says soda is very useful in the laundry, although it must not be used for some materials; and even where it is used, the clothes must be well rinsed afterwards to remove it all before they are hung out to dry.

"Close by was a pile of washing-powder,—I could not tell you how many packets there were. Mrs. Grant says that these powders like a great many other things, are very useful indeed, so long as one does not use too much. Many of the washing-powders, although they are a great help in removing the dirt, are even more injurious to the clothes than soda, because they contain lime, and the lime in them tends to rot the *materials*.

"*She says*, however, no harm is done, when they are used in small quantities, and dissolved first, like soda, in boiling water.

"Oh, but I had almost forgotten to tell you about our wonderful machines, mother," Norah continued. "Mrs. Grant has several of them; in fact she says she does not know what she should do without them, for they are such a saving of both time and labour. They are all very clever machines.



WASHING MACHINE.

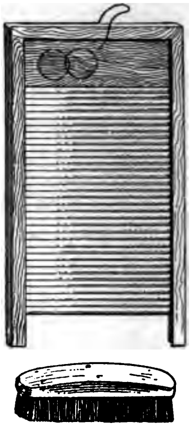
"The washing-machine consists of a sort of box or barrel, into which the hot water and the dirty clothes are put. You have only to turn a handle, to set the inside parts in motion, and they toss the clothes about from side to side, and soon wash all the dirt out of them.

"Mrs. Grant let us wash some things in the machines, and it did seem an easy way of doing it—much easier and quicker than by rubbing every part in the hands.

"She says there are many different kinds of washing-machines, but they all act more or less in the same way.

"She showed us, too, a curious old-fashioned *contrivance*, known as the barrel and dolly, which

BARREL AND DOLLY.



WASHING-BOARD AND BRUSH.

is still used in some parts of the country. The dirty clothes are put into the barrel with hot water, soap, and washing-powder, and the dolly beats and twists and tosses them about, till all the dirt is removed.

"She uses a grooved washing-board and a brush for stocking feet, and coarse things, but that treatment would be too rough for fine linen.

"How we girls all laughed when she told us about the women in Scotland and some other parts, who wash the clothes in a big tub, by stamping upon them with the feet."

Summary.—Use the best soap; it is cheapest in the long run. Never use new soap; it is very wasteful. Washing-powders are good, if used sparingly.

WOOLLENS AND COLOURED THINGS

"We have been learning to wash flannels and coloured prints to-day, mother," said Norah, "and it was a surprise to all of us to see what special sort of treatment they require. They are not washed in the same way as we wash other things. First of all, they *must not be soaked in water* beforehand; then again, they *must not be rubbed, and boiled, and wrung out*—but there, I will tell you all about our lesson.

"*Mrs.* Grant began by handing to each of us a flannel garment of some kind. Mine was a petticoat, and Nellie had an under-vest.

"She called our attention to the material itself, and pointed out that it is more loose in texture than other materials, that its threads are easily pulled apart and broken, and that its surface is covered with a soft woolly nap.

"She reminded us of the importance of these woollen garments, too. She says, although it is necessary to get the dirt out of them, every care must be taken not to spoil them, for they cost more money than any of our other underclothing.

"She says nothing so soon spoils flannels and all woollen materials as bad careless washing, but with care they will last for a long while.

"After this explanation it was time to set us all to work. Each girl had a bowl of boiling water, and we cut some thin shavings of soap into it, stirring it about till all the soap was dissolved. We poured this into our tubs, which we had, in the meantime, half-filled with tepid water, and then we stirred the water about with our hands till a good lather was formed.

"We were now ready to begin, and Mrs. Grant started us something like this: 'Now girls,' she said, 'we are going to put the flannels straight into the lather, without any previous soaking. Remember, too, we never use soda for these or *any other* woollen materials, and we never rub them. Such treatment would cause them to shrink up, and become matted or felted. Now watch what I do, and copy me.'

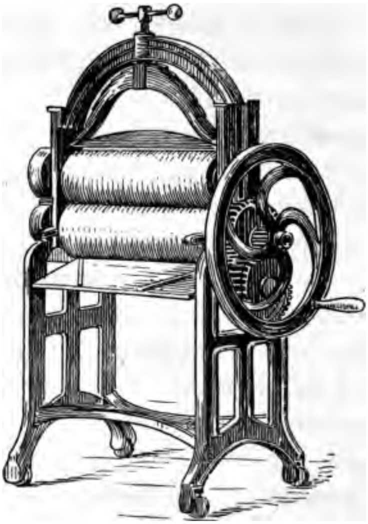
"She put one of the flannel articles into the water, dipped it up and down for a little while, pulled it loosely through her hands several times, and moved it about briskly to and fro in the water, and all this time we were doing exactly the same with our flannels.

"When most of the dirt had been removed in this way, we had to empty the dirty water from our tubs, and repeat the same kind of washing in a second lather, till the things looked clean.

"After this we rinsed the flannels in clear lukewarm water to get rid of the soap, and, when that was done, we first squeezed the water out of them, as well as we could with our hands, and then passed them through *the wringer*. This clever machine pressed all the water out, without twisting or pulling the material; and then all we had to do was to shake the flannels to bring up the woolly nap.

"Mrs. Grant is very particular about drying flannels. She says they should always be dried in the open air, if the weather permits. When she is compelled to dry them in the drying-room, she is careful not to put them too near the fire, as that would make them shrink and become *hard*.

"Before we left these woollen things, she showed us how to wash stockings, and next time we are going to wash some stockings ourselves. She first washed each one on the outside and then turned it inside out, and washed it again. Then all she had to do was to rinse them, and hang them out, just as they were, to dry.


WRINGING MACHINE.

"Prints, and all coloured things, require as much care as flannels, or the colours will run. Like flannels we wash them in a lather; and Mrs. Grant says we must never use either soda *or washing po*wder with these things. She is ry careful to see that we do not rub too much ap on them, and says it is important not to ep them too long in the water, and not to ve the water too hot, or the colours will be sure go.

"In rinsing prints she puts a little salt into e water to fix the colours; and for some of the ings she adds a little vinegar. She says this a capital thing to brighten up the colours."

"I am delighted, my dear, to listen to all you ve to tell me," said her mother. "It shows e, Norah, that you have followed your lessons refully. The whole secret about coloured ings is to get rid of the dirt without spoiling e colours. To do this it is necessary to wash d dry them as quickly as possible. The drying as important as the washing. They should be rung very dry before they are hung out, because e more quickly they dry the less risk there is the colours running and fading."

Summary.—Woollens and coloured things are not to be soaked ore washing. No soda must be used for them, and they must not rubbed. They should be dried quickly, and in the open air if sible. A little salt or vinegar will help to fix the colours in oured things.

DRYING, FOLDING, AND AIRING

Norah's mother was standing at the door one ight, sunny afternoon, as she and her two usins came tripping up the garden path.

"Well," she asked, when the first greetings were over, "what have my busy little women been doing at the laundry to-day?"

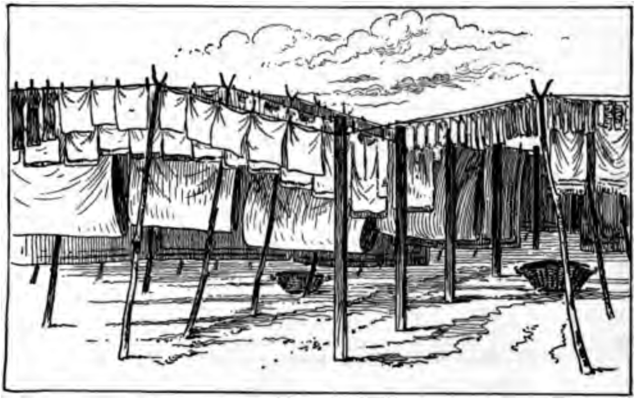
"This is the big washing-day at the laundry, mother," said Norah, "and Mrs. Grant has been instructing us in drying and folding. When we got there, the women were all hard at work, and some of the things were already washed, boiled, and rinsed, just ready to hang out. These we carried away in the clothes-baskets to the drying ground; and two of the girls followed, with a large basket full of pegs."

"How particular Mrs. Grant was with the clothes-lines and the pegs," said Maggie. "Before she would allow any of the things to be hung out, she made two of the women go round and rub all the lines with a clean cloth; and she looked at the pegs in the basket to make sure there were no dirty ones."

"I am sure I shall never forget what I have learned to-day," said Nellie. "I used to think it didn't matter how the things were put on the lines, so long as they were hung out; but now we know there is a proper way to hang each one."

"As this was our first lesson, the women hung out all the things, while we looked on," said Norah; "but next time we are to do some of it *ourselves*. Mrs. Grant stood by all the time, and *explained* to us how each article was to be hung out.

"Of course, each article of clothing is hung up, inside out, just as it was left after the washing; and before it is put on the line it must be well shaken out. Mrs. Grant says it is best to peg all body-linen up by the thickest parts, because there is less risk of it being torn by the wind, and at the same time it gives the water a better chance of draining out.



"She set us to thread the collars and cuffs on a string through the button-holes, and then she tied the string to one of the lines. This, she says, is the best way to dry small things like these; it saves pegging them up, one by one.

"By the time the first batch of things had been hung out, others were ready, and in a little while, all the lines were full. As each line was filled, it was propped up with tall props, to keep the things well out of the way. The drying-ground was then a sight worth seeing, for all articles of the same kind were hung up together. In one place were all the shirts, and the rest of the body-linen; in another, the large things, such as sheets and table-cloths; in another, the collars and cuffs, and so on."

"Mrs. Grant is very particular about the sheets and table-cloths," said Nellie. "She has them pegged up by the two hems, so that they hang like a sort of bag, and the wind in this way blows through the bag, and soon dries them.

"It was a splendid day for drying; there was a brisk wind, without too much sun, and some of this first batch (thanks to the wringer) were dry before we could believe it. Then of course we had to assist in taking them in; but by this time the flannels were ready to be hung out, and then came the coloured things, and the stockings. We all helped to hang out the stockings; they have to be pegged up by the toes.

"Don't you remember, Norah, how careful Mrs. Grant was about the pegs, as we helped to take the things in?" asked Nellie. "She made us put them all in a basket, for fear they might fall on the ground, and be made dirty."

"Yes, I remember," said Norah; "but I think, after all, the best fun was the folding. We did *this in the big* room, mother, and we began with the sheets and table-cloths. I knew how to do this, you know, for I have often helped you. Two girls took the sheet at the corners, and after giving it a shake, folded it, by carefully putting the corners together, just as you do it.

"When these were all done, Mrs. Grant showed us how to fold the smaller articles of clothing. We did this at a table, which was covered with a clean white cloth.

"Each garment had first to be turned, because it had been dried on the wrong side. Then she showed us how to shake and pull the things, to bring them into the proper shape, and afterwards to sprinkle them with water, and fold them up neatly, and tightly.

"All these things have to be either ironed or *mangled.* The bed-linen is only mangled, but it is best to mangle all body-linen first, and iron it afterwards, because it not only looks better, but will keep clean longer.

"We sprinkle the things, and fold them up tight to damp them all over, because they would not mangle or iron well, if they were quite dry."

"Mrs. Grant was very careful to point out to us the importance of properly airing all articles of clothing and bed-linen, after the mangling and ironing," said Maggie. "Of course, all the things must be very damp, after being sprinkled with water in the folding.

"She says it is very unwise, and very dangerous, to wear any article of clothing, or to use *sheets or bed-linen* that have not been thoroughly uired. We shall hear more about this, when we go into the ironing-room."

Summary.—As all articles require to be sprinkled with water uring the folding, it is essential that great care should be taken to horoughly air them before they are put away for use.

STARCHING AND IRONING

"I shall soon be able to help you iron ather's shirts, mother," said Norah. "Mrs. rant gave us our first lesson on ironing a shirt o-day. Of course, we have had a good many essons in the ironing-room now. I remember he first day we began with handkerchiefs.

"We all felt like grown-up women, when we tood at the ironing-table, with the iron in our and, for the first time. I know I did. But I ave helped you so often since then, that I can o simple things like these easily enough now.

"The only thing needed in ironing a handerchief is to see that the edges are well pressed ut, and that it is neatly folded, corner to orner.

"We have had plenty of practice at the laundry ince then, and it is easy enough now, so long s we make sure that the iron is just the right eat—not too hot—and that it is rubbed quite *lean before* we use it.

"Lately we have been having lessons on starching. Mrs. Grant uses cold-water starch for all linen articles, and boiled or hot-water starch for print, muslin, and lace things."

"Can you tell me how to make the starch, dear?" asked her mother.

"Oh yes, mother; I think so," she replied. "Cold starch is easily made. It has simply to be mixed with cold water, but we have to be careful to see that there are no lumps. It should be smooth like cream. Mrs. Grant always dissolves a little borax in boiling water, and when it is cold, adds it to the starch, to help to whiten the things. She also adds two or three drops of turpentine to it, to give the linen a fine gloss;

but she says we must be very careful not to use too much, for that would cause the things to rot.

"Hot-water starch is mixed in the same way, and then, when it is quite smooth, boiling water is poured on it. It must be kept stirred, as the boiling water is added; and, instead of turpentine, Mrs. Grant always puts a piece of white wax into it, to prevent the iron from sticking.

"But shall I tell you about the white shirt, mother? Mrs. Grant says this is the most difficult of all things to iron."

"Yes, dear," said her mother. "I should like to hear all you can tell me about it."

"Well, Mrs. Grant began by starching a number of shirts, one after another. She took the front first, and dipped it into the basin of cold starch with one hand, while, with the other she kept stirring and moving the starch about, and squeezing the front well, to make sure that every part was thoroughly wetted.

"Then she wrung the front out as tightly as she could, and treated the cuffs in the same way.

"After this she put front and cuffs together, and folded the shirt up very tight, sprinkling a little cold water on the other parts as she went on. Then, one by one, she laid them aside for *some time.* She says she likes them to lie in the starch for about an hour before they are ironed."

"That's very good, indeed," said her mother. "Now can you tell me about the ironing?"

"Let me see," she replied. "She first shook out the shirt, and pulled all the parts into shape. Then she folded it down the middle of the back, and ironed that part of the body, and the thick part of the yoke.

"After this she ironed the sleeves, one by one, and then all the body of the shirt, so that the starched parts were left till the last. Before beginning this part of the work, she took a fresh hot iron from the stove, rubbed it perfectly clean, and then commenced with the cuffs. After pulling them again into shape she ironed them lightly, first on the wrong side, then on the right; and then once more on the wrong side. Lastly she pressed them rather heavily on the right side, and this, she said, was to give them a good gloss.

"But the front is the most important part of the shirt, and requires most care. For this, she had a small board, covered with two or three layers of flannel, which she put under the front. When she had pulled the linen into proper shape, she ran a fresh hot iron rather quickly *several times* all over it, beginning at the lower *part, and* working up toward the collar band.

"At each movement of the iron, the front began to look more smooth and glossy, and at last she finished it off with the polishing iron."

Summary.—Cold starch, with a little borax solution added, is best for linen articles. Boiled starch should be used for print, muslin and lace things. Two or three drops of turpentine with the cold starch will give the linen a fine gloss.

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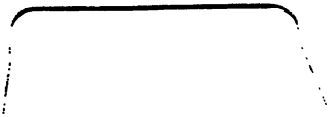

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